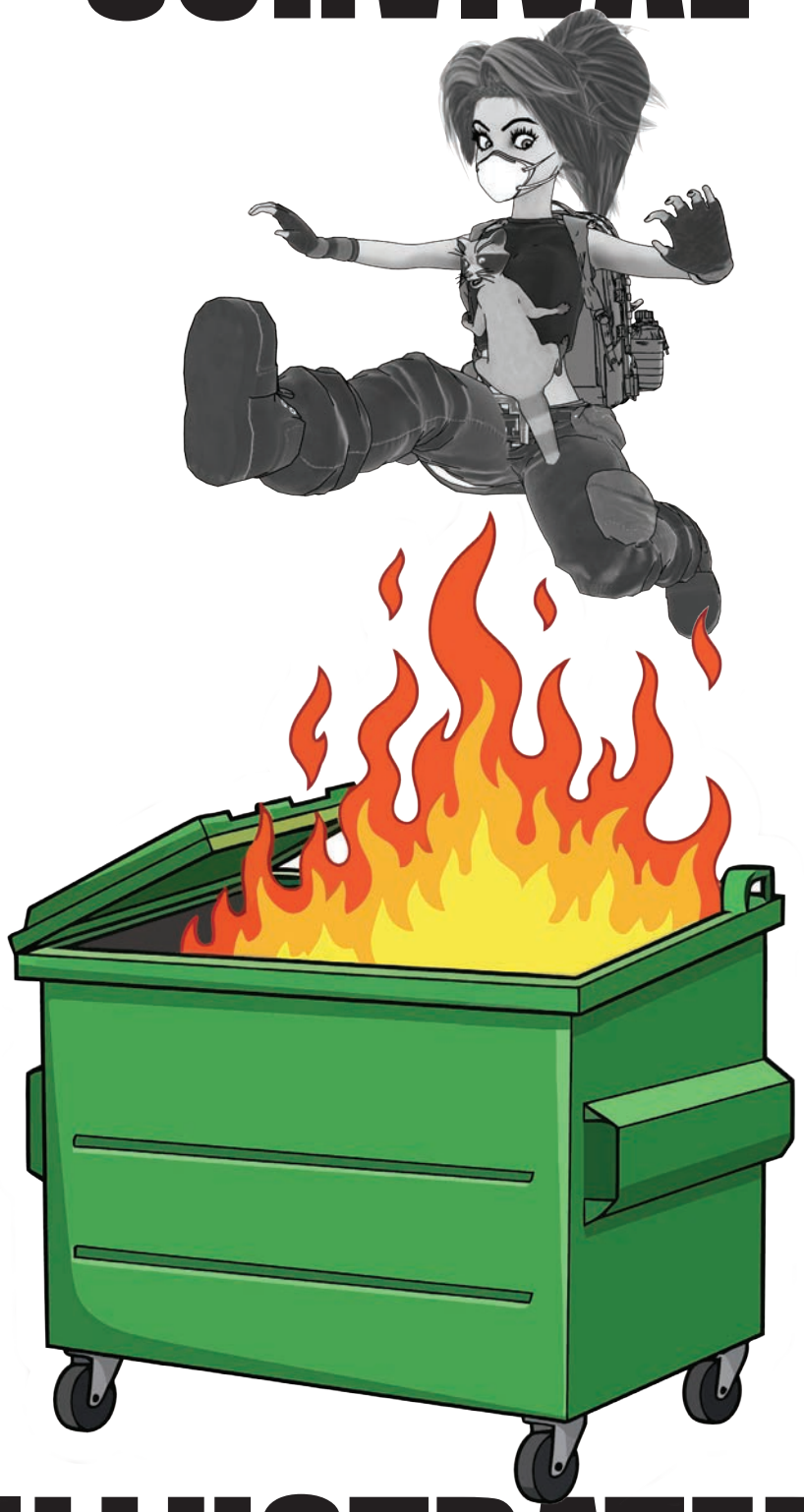
SURVIVAL



ILLUSTRATED

Jessica W.

Introduction

This guide wants to do one thing: help people.

If you're trying to make it through a drought or a heatwave, this book will help you. If you're preparing for shortages or emergencies, this book will help you. If you're trying to figure out how to grow food or forage for it, this book will help you.

You're reading the second edition of an illustrated survival guide, designed to give you thorough but simple information about how to make it through short-term and long-term disasters, including shortages and supply shocks caused by global instability. Expanded versions will come out over the next few years, but this guide offers nearly 350 pages of vital, evergreen information. Ultimately, a hard copy means you can access the information in here regardless of where you are, and regardless of grid status.

Many of us already have a few survival guides. We subscribe to newsletters and YouTube channels. We watch guides explain some or most of what we need to know in order to start projects, but even the best guides still leave us confused or wandering around online looking for the bits and pieces of information that we didn't get. This guide also strives to solve that problem, with clear and often detailed illustrations offering instructions that fill those gaps and don't assume anything about knowledge you're bringing to the table.

We're also trying to be realistic here. If you can do it yourself, then this guide explains it. But if you're better off hiring a professional, this guide just comes out and says it rather than hiding those concessions halfway through.

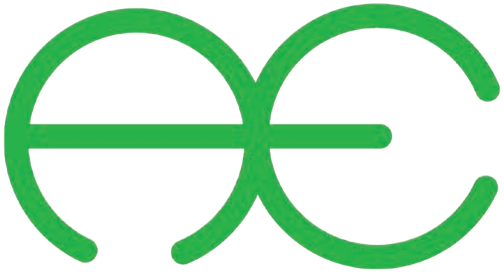
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Stay safe. Stay sane. Stay kind.

- Jessica Wildfire

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How to Store Food

This chapter explains the basics of food storage. You'll learn how to calculate your food needs, create storage space, basic food preservation, and what foods store best. Later chapters will cover advanced food preservation like canning. For now, you're just focused on the essentials.

A Conversion Cheat Sheet



1 lb = 16 oz, 0.45 kg, 0.47 liters



1 gallon = 4 qts, 128 oz, 3.9 kg, 3.8 liters



1 qt = 4 cups, 32 oz, 0.9 kg, 0.94 liters



1 pt = 2 cups, 16 oz, 0.45 kg, 0.47 liters



1 cup = 8 oz, 0.24 liters



1 tbsp = 3 tsp, 15 ml



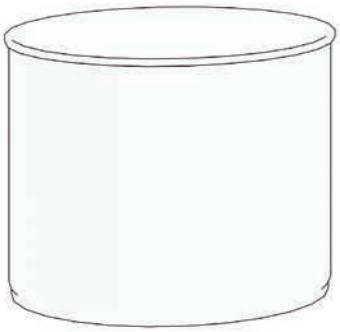
1 tsp = 5 ml, 3-5 g



Abbreviations

Pound (lbs), gallon (gal), quart (qt), pint (pt), ounce (oz), tablespoon (tbsp), tsp (teaspoon),

A Few More Conversions



1 #10 can = 104 oz, 13 cups, 3 liters



1 #401 can = 28 oz, 3.5 cups, 0.83 liters



1 mason jar = 4 cups, 32 oz, 0.94 liters



1 #2 can = 20 oz, 2.5 cups, 0.59 liters



1 #303 can = 17 oz, 2 cups, 0.5 liters



1 #300 can = 15 oz, 1.9 cups, 0.44 liters

#300 and #301 cans are commonly used for vegetables. Mason jars come in many sizes, with the 32 oz size one of the most common. They're technically listed as 32 ounces, but that's assuming you fill them all the way to the top. For storing dry goods, you might want to fill them to the 24 oz mark or a little over.

How Much Do You Need?

You can find plenty of food calculators online. They give similar answers. Below, you'll see how much food one adult needs for one month. It's about the same for children over seven.

One Adult/One Month

Grains (33 lbs/15kg)

Wheat, Flour, Corn meal
Rice, Oats, Pasta

Meats (2 lbs/.9kg)

Jerky, Canned tuna/salmon

Legumes (6 lbs/2.72 kg)

Dry Beans, Split Peas, Lentils
Lima Beans, Soy Beans, Dry Soup

Milk (8 lbs/3.6kg)

Condensed Milk
Evaporated Milk



Fruits & Veggies (26 lbs/11.8 kg)

Dry Bananas, Dry Blueberries
Raisins, Dry Broccoli
Spinach/Kale Flakes, Dry Carrots
Dry Strawberries, Dry Corn

Fats & Oils

Peanut Butter (1lb/.45 kg)
Vegetable Oil (1 gallon/3.8 liters)
Mayonaise (1 qt/.94 liters)
Salad Dressing (1 qt/.94 liters)
Shortening (1 qt/.94 liters)
Olive Oil (1 qt/.94 liters)

Cooking Essentials

Baking Powder (1 lb/.45 kg)
Vinegar (1 gallon/3.8 liters)
Salt (1 lb/.45 kg)
Yeast (1 lb/.45 kg)

Sugars (5 lbs/2.27 kg)

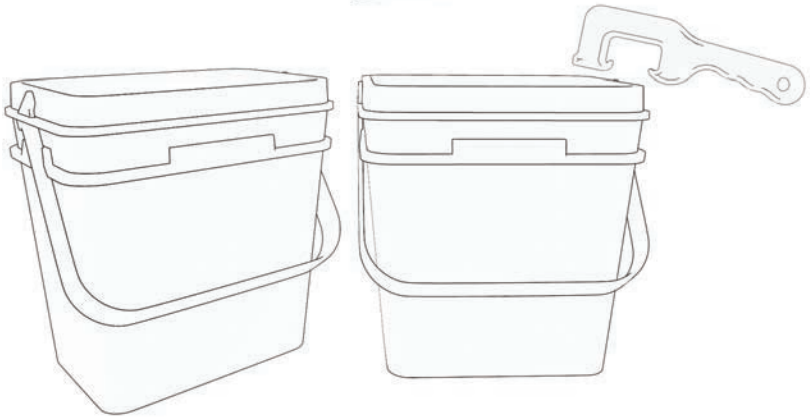
White Sugar, Honey, Syrup
Brown Sugar, Jelly/Jam

These numbers offer general guidelines. Size them to your own needs.

How Do You Store It?



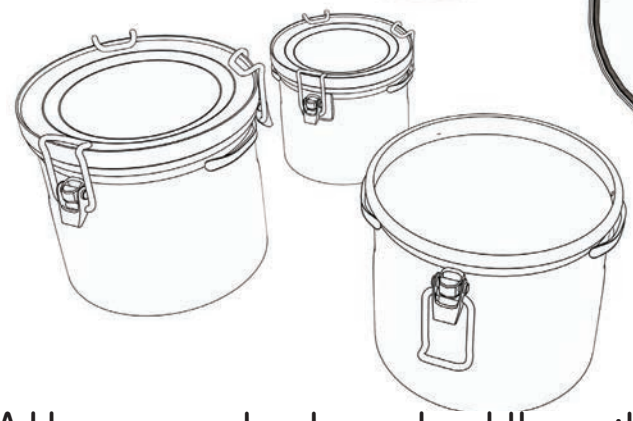
You can store dry foods like wheat berries, oats, rice, beans, lentils, and pasta for 10+ years in mylar bags. Keep a bucket opener near them. (They can be hard to open.)



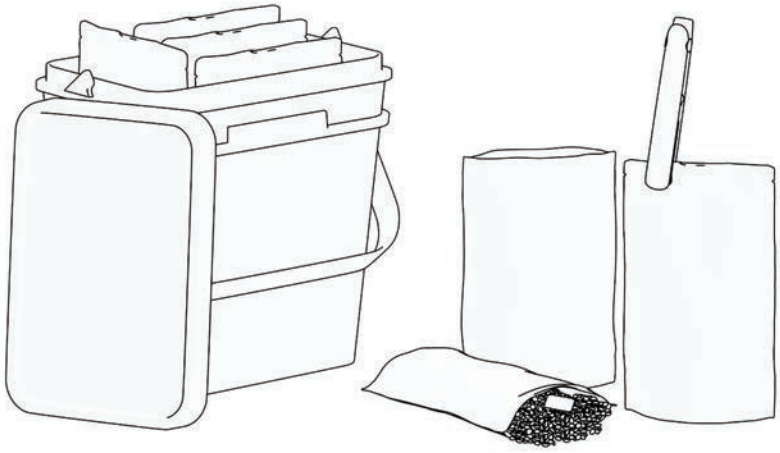




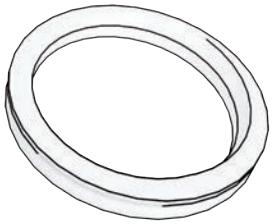
Large containers made with foodgrade steel (304 or 306) work well for rotating bulk foods. They have silicone seals and latches to keep out air. Keep scoops inside and transfer food to smaller containers as needed. When you open up a food bucket, pour it into one of these if you don't want to keep re-sealing the containers over and over.



Add an oxygen absorber and seal them with a flat iron. Put the bags in foodgrade 4-gallon buckets. Use 500 cc size absorbers for gallon bags and 2 1000cc size absorbers for five-gallon bags.

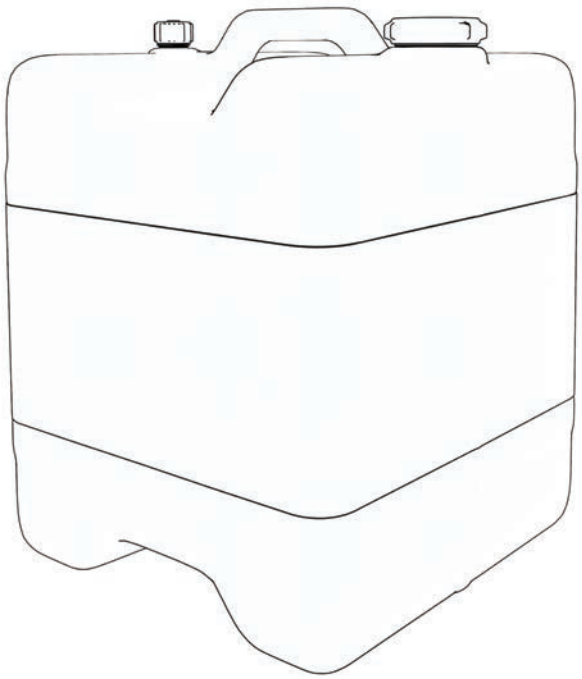






Gamma seal lids provide an airtight seal on round food buckets, and they're much easier to use. If you prefer the square ones, then it's a limitation.

How Do You Store Water?



One person needs at least 30 gallons of water for a month of hydration and basic sanitation. Aquatainers are great, foodsafe containers for storing water. A standard Aquatainer holds 7 gallons. Some models are stackable, but they hold slightly less. Wash them out first. When you're washing, use the same formula as you do when storing water. Just a little bleach in water will sanitize the container if you shake and roll it.



You can maximize your water's life by adding 1/2 tsp of regular, unscented household bleach (8.25%) to 8 gallons and mixing thoroughly. For an Aquatainer, use just shy of 1/2 tsp. For 6% bleach, use 2/3 tsp.

Rotate through your stored water every 6-12 months.



How Do You Can Food?

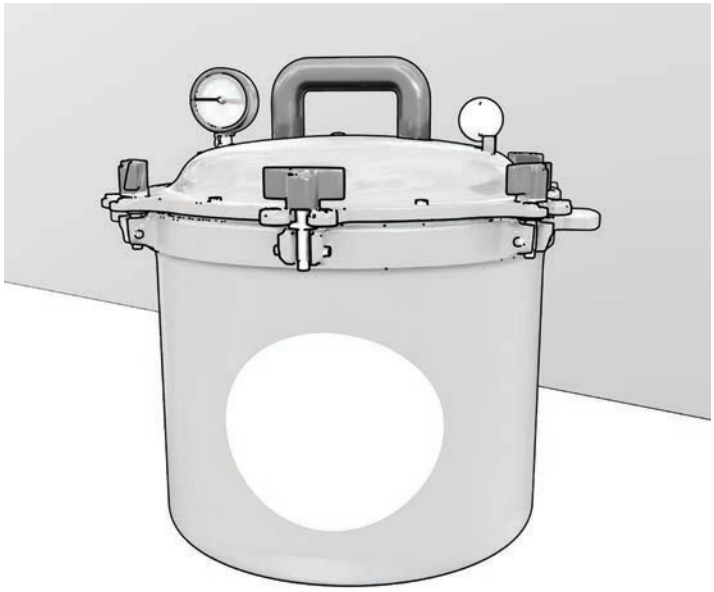
Canning can dramatically increase your food diversity. Once you learn the basics, it doesn't feel so overwhelming. You'll know how to do it properly, and you'll know when a seal breaks or doesn't form properly. Especially if you're starting out, use Ball Mason Jars and their recipes. You can also use recipes from Ball, Kerr, USDA, and the NCHFP (National Center for Home Food Preservation).



Four Methods for Canning

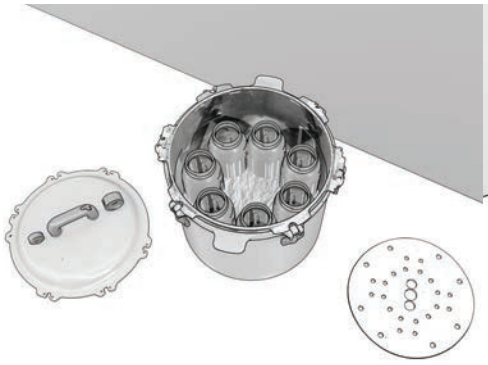
There are four main types of canning:

* Water Bath Canning: You submerge your jars in boiling water for a specific length of time. It doesn't require close attention to pressure, only temperature. Water bath canning only works well on foods with high acidity.
* Pressure Canning: You fill a pressure canner with roughly 2 inches of water, then seal the lid and follow a more specific series of instructions. It works best with foods that have low acidity.
* Hot Packing: You boil or blanch the food you're going to can first. You pack your food, and then you pour in boiling water to the headspace level. You can use this method with water bath or pressure canning.
* Raw Packing: You don't boil or cook the food before canning. You can add boiling water to the jar, but it's not required. You can use raw pack canning with water bath or pressure canning.



You don't have to have a garden to can. You can can bulk items from the store, to make them more manageable. Canning supplies vary a lot in cost. You can start water bath canning without spending much money. If you're serious about it, then you can invest several hundred dollars in a pressure canner and supplies that will last you for the rest of your life.

Canning, The Basic Steps









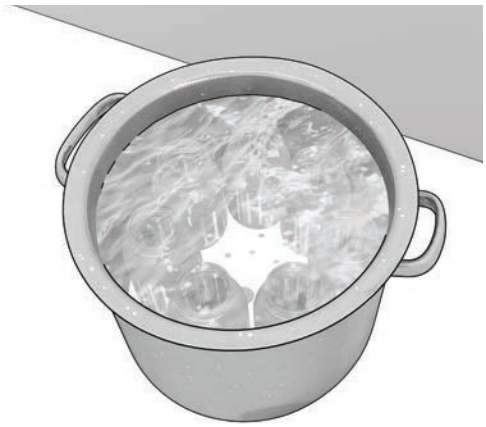




Hot packing then pressure canning involves the most steps, so we'll start there. The steps vary a little by food and recipe, but they follow a general method and principle.

1. Start by adding 2-3 inches of water to your pressure canner. Heat the water to 180F degrees.
2. Keep the jars hot while you prepare the food. This keeps the jars from cracking once you start adding the contents.
3. Next, start preparing your food. Some foods, you'll boil. Others, you'll blanch or roast. If you're blanching, you bring the water to a full boil before adding your food. You boil for 30 seconds to a few minutes, then you take it out and move it to a cold bath, then dry it.
4. Transfer the food to your jars. Use a funnel. Leave about 1 inch of headspace.
5. Use a thin spatula, a chopstick, or a debubbling tool to remove bubbles.
6. Wipe the mouths of the jars with vinegar to remove any food particles that will interrupt your seal.
7. Place the lid on with the ring/band, and "finger tighten" it. Don't use a full grip.
8. Move your jars to your canner, with gloves or jar lifter tongs.
9. Lock the lid, but leave the pressure vent open. Heat the canner up and let it steam out/vent for 10 full minutes.
10. Close the vent. Use your pressure gauge and regulator to cook the contents at 10-15 lbs of pressure, depending on the recipe, for the specified time.
11. Turn off the heat. Let the canner depressurize on its own (0 PSI).
12. Wait 10 more minutes for everything to cool down, then open and remove the jars with your jar lifter tongs.
13. Let the jars sit overnight, 12-24 hours. Remove the rings and inspect the seals by pulling gently with your fingers only. If the lid stays on, you have a good seal.

Canning, Variations



Once you understand hot pack and pressure canning, everything else sounds simple. Water bath canning requires fewer steps, and there's only a few big differences. First, you don't have to monitor or regulate the pressure. Second, you're completely submerging the jars under water and then cooking for a specific duration.

When you raw pack, you don't have to cook the food first. You might add boiling water to fill up the rest of the jar, but it's often not required. You can technically use hot pack canning for everything, but some foods look and taste better when you cold/raw pack, as long as it's safe.



According to many homesteaders, you can reuse the rings/bands until they start to show significant rust. However, you can't reuse the lids. Canning lids contain a special compound on the underside that forms a seal only once. They also dent after the first use, just enough that they're no longer capable of forming an airtight seal. After the first use, they're no longer safe. You might be able to store short term dry goods with those lids, but that's about it.

If you're planning for a future where new lids are hard to get, stock up on them now.



Brandwise, most homesteaders only use Ball or Kerr Mason jars for safety reasons. Each company offers canning guides, and they're worth having. Instructions can vary a little depending on the food. These guides also explain how to adjust your pressure settings when you're cooking at different altitudes. Mason jars come in a variety of sizes. They're suited to different kinds of food, but they're all safe to use. Almost anyone can start canning with basic supplies, and it's a good way to transfer bulk wet foods to more manageable containers, to maximize food stores and reduce waste. Below, you'll see a basic introductory list of foods that generally need pressure and/or hot packing. (It's not exhaustive.)

Require Pressure Canning:

* Meats/Seafood
* Carrots
* Potatoes
* Beets
* Beans
* Corn
* Mushrooms
* Asparagus
* Okra
* Leafy Greens

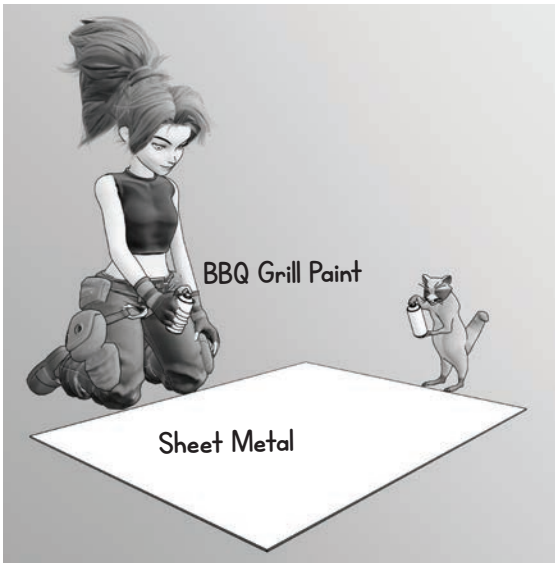
Hot Packing Strongly Recommended:

* Meats/Seafood
* Carrots
* Apples
* Apricots
* Berries
* Cherries
* Peaches
* Pears
* Beans
* Asparagus
* Okra

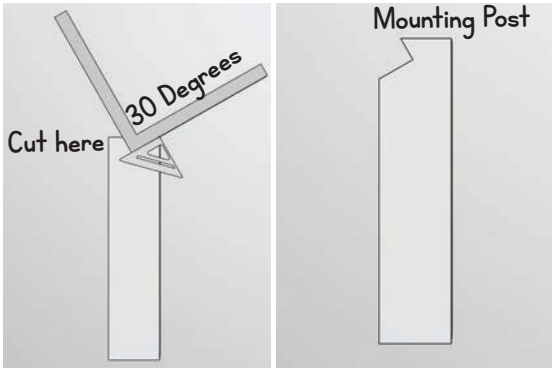
You can raw pack and then pressure can some foods, even meats, but hot packing first maximizes safety.

How Do You Dehydrate Food?

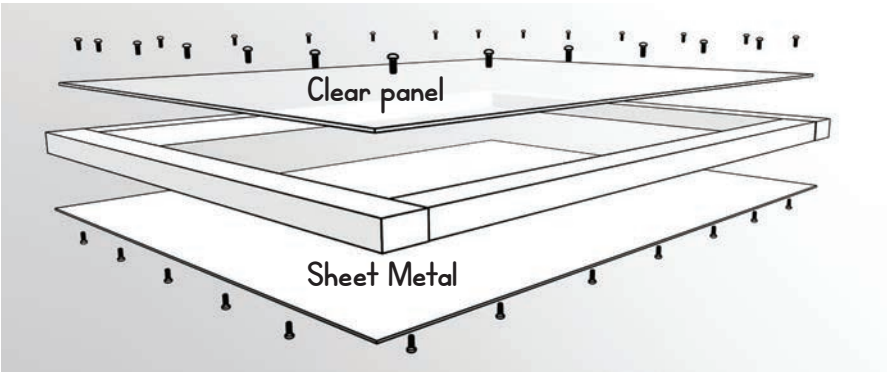
A solar dehydrator can help you preserve and store food for the long term. This design doesn't expose your food directly to the sun. It uses radiative heat to do the drying.



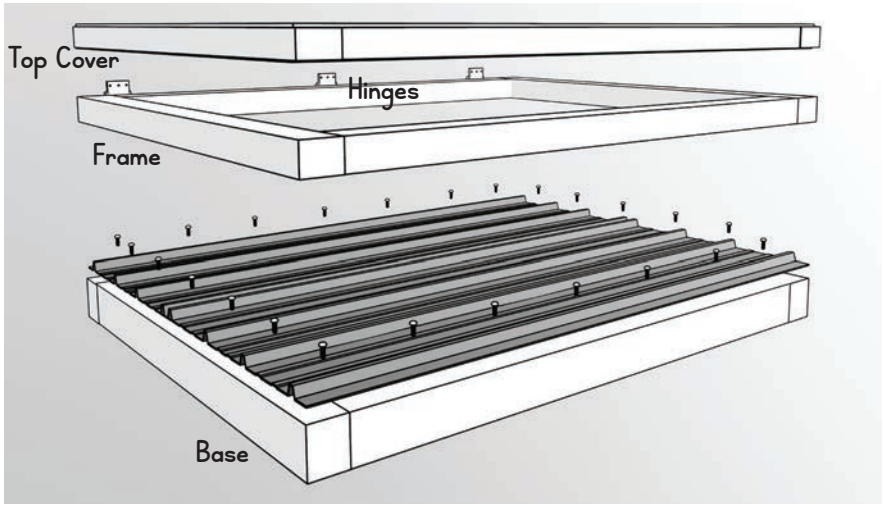
Start with a piece of 28-gauge sheet metal. Give it two coats of black BBQ grill spray paint.



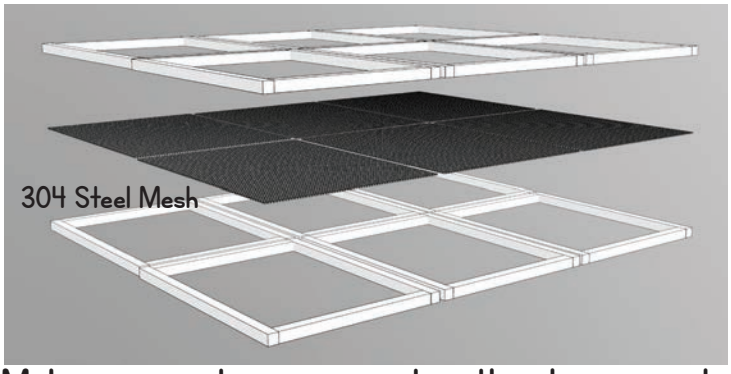
You'll want to mount your dehydrator at 30 degrees to catch sun. It also lets heat and moisture rise up through the unit. Build a mount with 2x4 lumber or something similar. Use a speed square to mark a 30 degree angle, then a framing square to mark out the rest of the nook where your dehydrator will sit. Use a saw to cut it out.



Make the top cover by screwing together lumber sized to the sheet metal. Screw the sheet metal to one side. To the other side, screw a piece of clear polycarbonate or acrylic. A piece of acrylic will produce fewer fumes during heat.

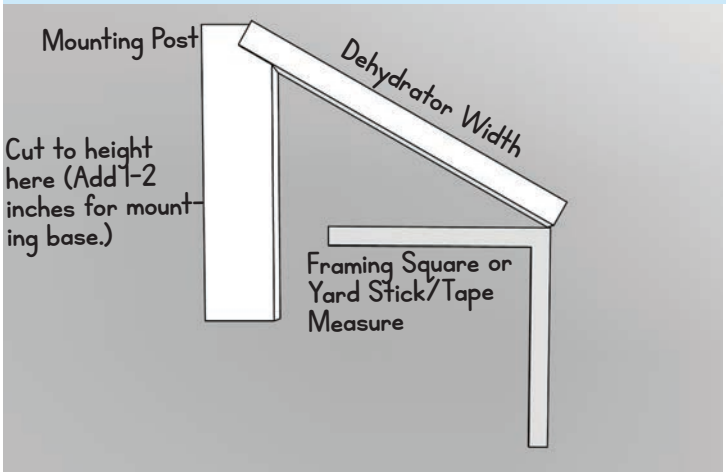


Make a main frame, and add hinges. Attach the top cover to the frame. Next, make a base with lumber, then fasten a piece galvanized metal roofing over it.

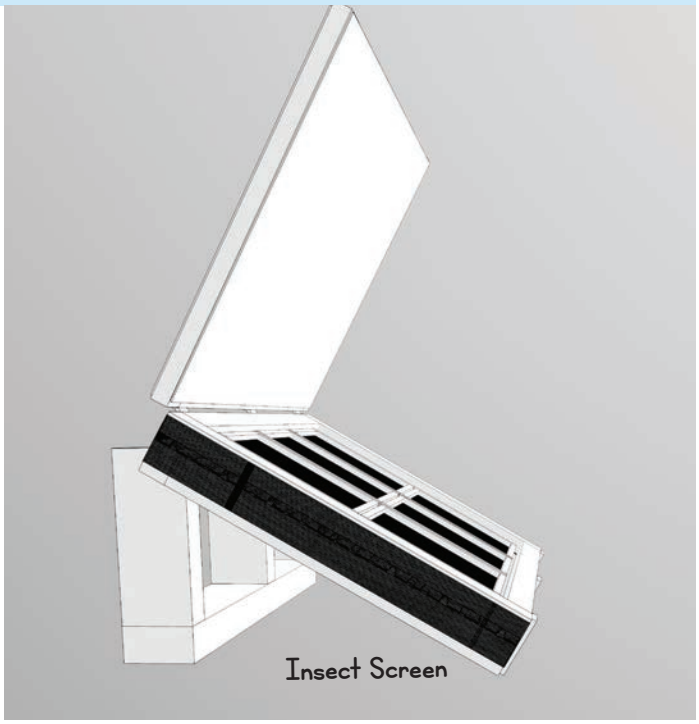


Make screens by screwing together 1" square dowels or something similar. You can make one or several, as pictured here. Sandwich pieces of 304 (food grade) stainless steel mesh. You can find it at hardware stores.

Finishing Your Dehydrator



To measure the height of the mounting stand for your dehydrator, lay one piece flat on the ground. Take a piece of lumber the same width of your dehydrator and place it in the notch. Use a framing square or a yard stick to mark the bottom. Cut there.







Mount 2-3 brackets to the base, to keep the frame secure. The frame will rest on the bed. You'll add your food to the screens, then place them on metal roofing. Your food won't touch the metal.

Finally, wrap some mosquito netting or window screen around the gap where the frame sits on the base. That allows airflow, but it keeps out insects. If you need more air flow, drill holes in the sides and cover with netting.

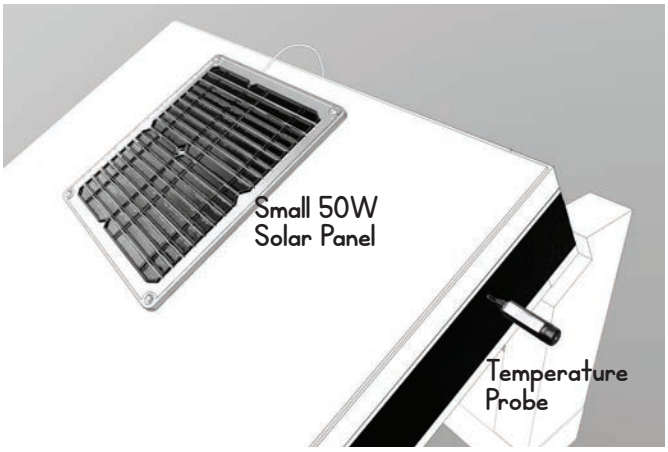
Tips for Dehydrating

A solar dehydrator can reach 120-140F degrees, even on a cloudy day. Most fruits and vegetables will dry in about 12 hours. They should retain only 10-20 percent of their moisture. (You can test with strips.) If you want even more air flow, you can buy a DC solar fan kit at many hardware stores or online. They're easy to mount.

If you plan on dehydrating food on a regular basis, it's worth keeping a separate guide with instructions for each food you grow.

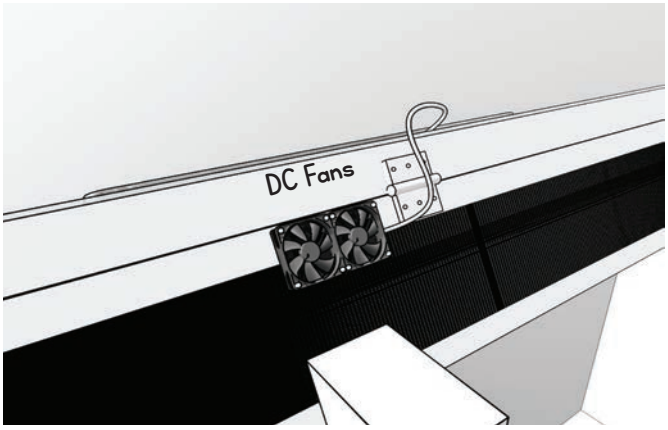


More Tips on Dehydrating Food



Most foods need to stay around 120-140F to dehydrate properly. You can add a temperature gauge to your dehydrator to ensure food safety. Drill a small hole into the side for a temperature probe. You'll want a heavy duty waterproof one with a probe that runs 5-12 inches, long enough to pass the lumber and get a good read. After you add the probe, seal the hole with silicone caulk. This way, you don't have to open the unit.

Here's what your dehydrator will look like once you've installed the extra features, like the DC solar fans and temperature gauges.



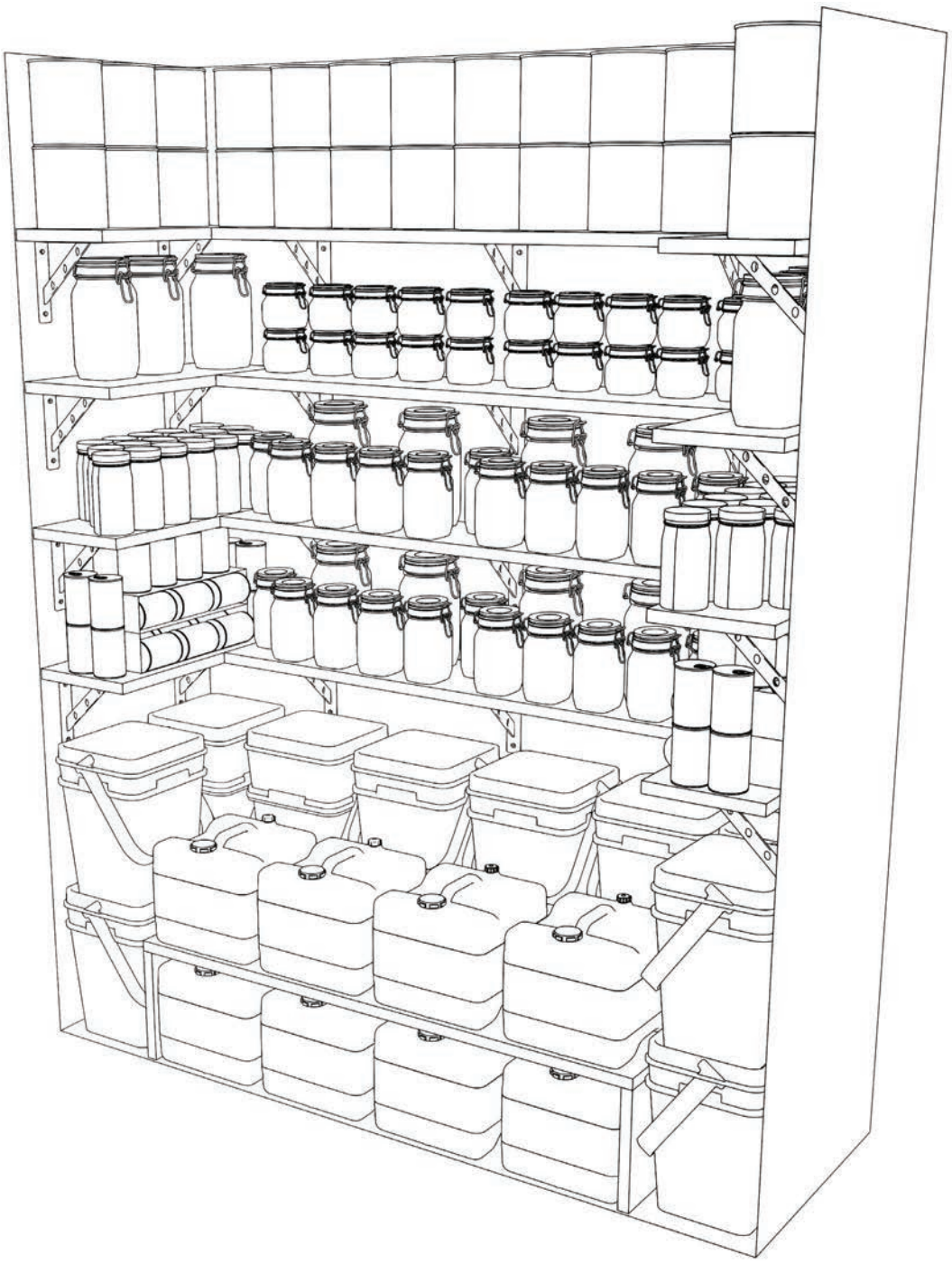
You can find plenty of other designs online, including bigger community-sized dehydrators that use a slightly different venting and heat transfer process. But you can make this design almost any size, large or small, and it's one of the simplest and most effective ones out there.

Final Tips on Dehydrating Food

* Use stainless steel or foodsafe plastic for the nonwood components. You don't want materials that will rust or leach contaminants.
* Use glass or acrylic for the top cover. Some preppers and homesteaders say polycarbonate is safe, but it contains BPA that can leach over time due to heat.
* You can dehydrate food on almost any day when outdoor temperatures reach the mid 80s F (30s C), even if it's partially cloudy. If you're not sure, check the temperature on your dehydrator before you start.
* Make sure the outdoor humidity stays at less than 60 percent.
* Keep the area around the dehydrator clean. Maintain it well. Don't allow vegetation to grow around it. That leads to moisture buildup.
* Most foods need to dry at 120-140F degrees. Low temperatures allow bacterial growth, and higher temperatures wind up cooking the food, not drying it.
* Slice fruits and vegetables thin to accelerate the drying process. Generally, you want slices 1/4 to 1/8 of an inch. Too thick, and they won't dry.
* Properly dried fruits should have a leathery texture. Vegetables should be crisp. Keep the food in a large clear container for 4-7 days to make sure it doesn't clump or form condensation. If it doesn't, it's ready for longterm storage in jars, bags, etc.
* You can buy special "dry cards" or "humidity indicator" cards that change color to indicate moisture levels. You can reuse them up to 20 times. Unused, they last 2-3 years if they're kept sealed in a cool, dry place. Some say they last even longer, but you probably don't want to rely on ones older than 5 years exclusively.

Where Do You Put It All?

You can convert a standard closet into a food storage pantry. This closet measures 2X6 ft and 90 inches in height. (Everything is to scale.) Store heavier items like food buckets and water containers on the bottom. Make sure you screw brackets to studs to hold the weight.



30 #10 Cans
(96 oz/2.8 liters)

14 100 oz (2.95 liters)
Latch lid Jars

20 17 oz (.5 liters)
Latch lid Jars

22 32 oz (.94 liters)
Latch lid Jars

30 Mason Jars
(24-32 oz, 0.7 liters)

64 14 oz (.41 liters)
Cans

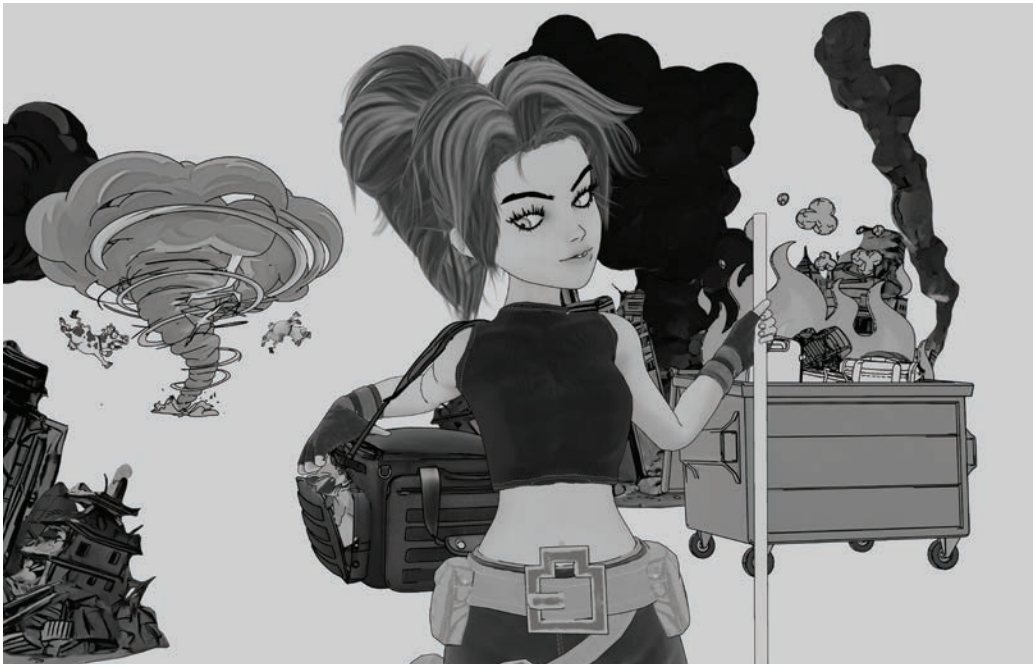
16 4-gallon
food buckets

8 7-gallon
Aquatainers

The average person needs 180-200 lbs (81.6 kg) of food per month. One standard closet could hold about 700-750 pounds of food and 56 gallons of minimum drinking water, sustaining 3-4 adults for one month. You can adjust the ratios of grains, legumes, fruits, vegetables, and other essentials for your needs.

How to Bug Out (or In)

This chapter covers the basics of bugout packing. Bugout bags can double as bug-in bags, consolidating emergency items into one load. Even if you're not going anywhere, it's good to have a bag. They help you organize and store emergency supplies.



Many people think they don't need a bugout bag because they don't have anywhere to go. The term "bugout bag" really just means a bag you keep emergency supplies in. Some people explicitly pack them to bugout. Many others keep them at home or their cars. It's just a way to organize and consolidate your gear, so it's not scattered all over your house or apartment.

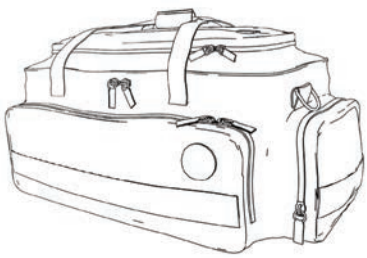




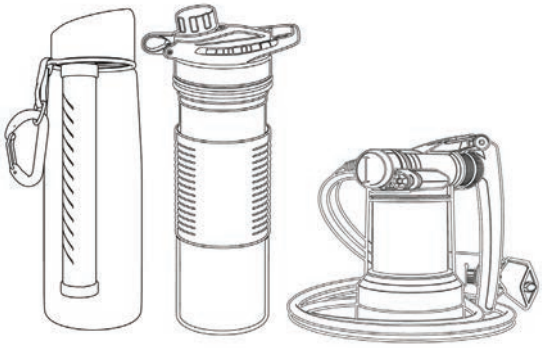
Anyone can build a bugout bag. You don't have to pack for weeks, and you don't have to buy premade kits. It's better to make your own, for your needs, something you know you can carry. According to conventional advice, you should plan for specific emergencies. However, we live in a world where multiple threats can hit anywhere, even at the same time. So, pack a multipurpose bag.



Sometimes, you'll bug out. Other times, you'll shelter in place. It depends on the nature of the danger and how much heads up you get. Either way, a good emergency bag will have the essentials you need to stay alive for a few days, or a few weeks.

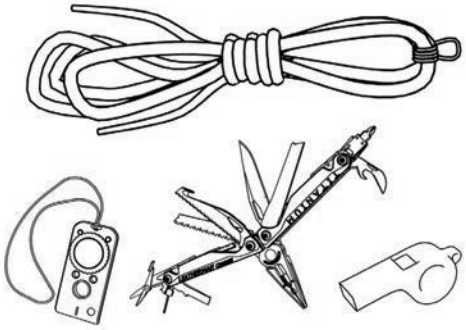


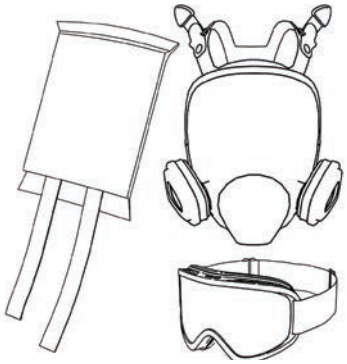
What Goes in a Bag?



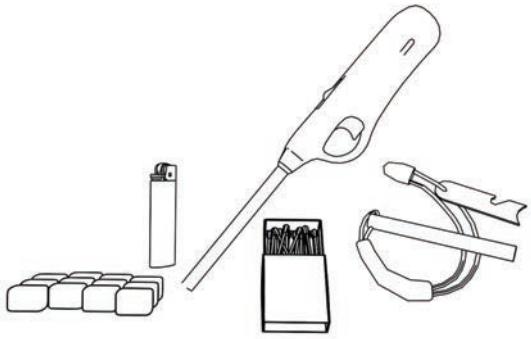
Water: 2L of water, water purifier

Basic tools: paracord, compass, multitool, camping cookware, folding stove, whistle



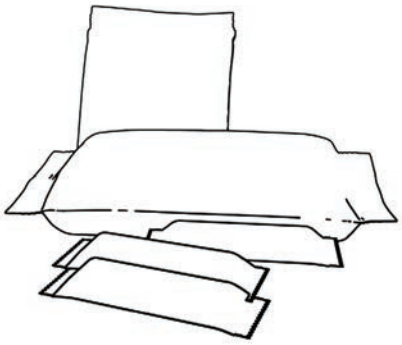


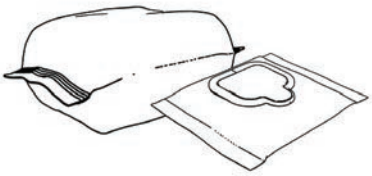
Hazard gear: fire blanket, respirators, goggles



Fire: Lighters, matches, ferro rods, fuel tablets

Emergency Food: freeze-dried meals & energy bars



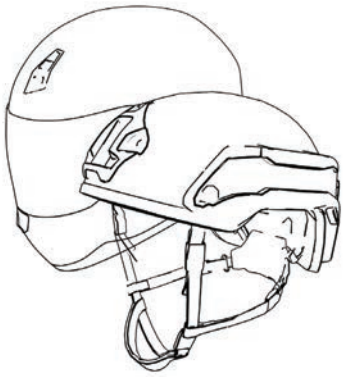


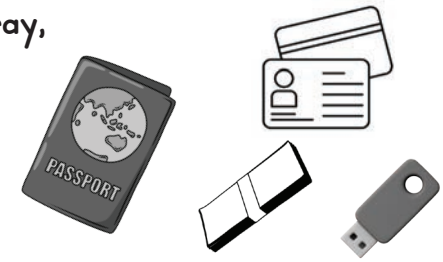
Kids: diapers, wet wipes, powdered baby formula, baby sling/harness carrier, toy



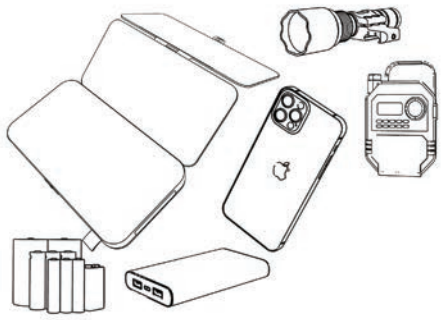
Medical: N95 masks, clotting agents, bandaids, gauze, alcohol pads, painkillers, extra meds, thermometer

Protection: helmet, pepper spray, tire thumper, other weapons.

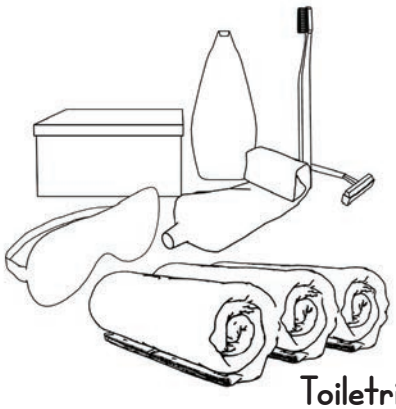




Transactions: Cash, personal identification, security key, flash drive, external hard drive

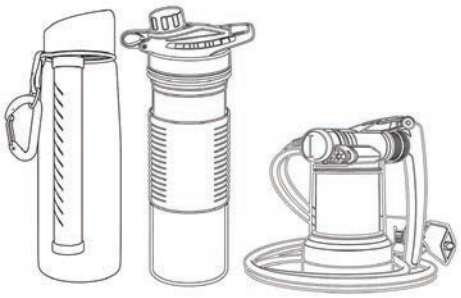


Electronics: portable solar charger, batteries, power bank, extra phone, weather radio, flashlight

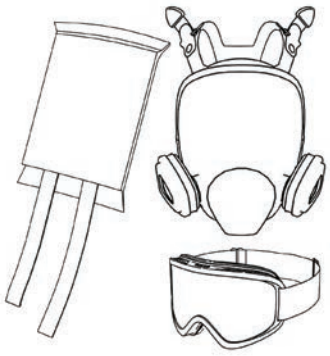


Toiletries

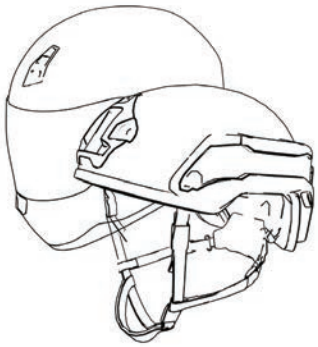
Important Details



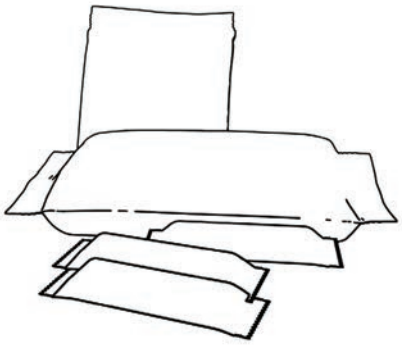
Lifestraws and Sawyer filters meet the minimum requirements. MSR Guardian filters out 99 percent of viruses and bacteria. Grayl Geopress filters out 99 percent of everything, including some heavy metals. Filters will last almost indefinitely if they're kept in their package and stored well. The highest quality purifiers have shorter lifespans once you start using them, so pack replacement filters if you can.



Most people in North America will choose between different half-face and full-face respirators from 3M. The easiest ones use bayonet P100 filters. The 69026 model covers the most VOCs (volatile organic compounds). With half-face respirators, use goggles from Bolle or HexArmor. If you wear glasses, you can order spectacle kits for respirators. Some Hexarmor goggles have side grooves to fit over glasses. Most goggles are vented, allowing small amounts of air through. Nonvented goggles almost always fog up and obstruct vision.



Motorcycle helmets offer superior head protection during emergencies like storms, and they're affordable. Tactical impact helmets are called bump helmets. They're less bulky but cover less of your head, and they're more expensive. Ballistic helmets offer protection against low-caliber gunfire, and sometimes high-caliber rounds. Some ballistic helmets also provide impact protection, but they're very expensive. Choose something that fits your budget and offers reasonable protection.

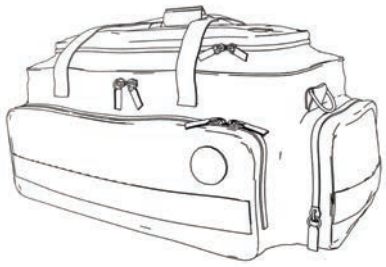


Freeze-dried meals last for years, but they're expensive. Many of them also contain a lot of sodium and other preservatives. They remain safe to eat, and they provide calories for basic survival, but their nutrients degrade over time. You can make your own with dehydrated foods, oxygen absorbers, and mylar bags. Rotate through them every 1-3 years. See the food storage chapter for more details.



A full medical kit starts with band-aids, bandages, gauze, alcohol pads, clotting agents, scissors, tweezers, a thermometer, and N95 masks. You might also want an oximeter, duct tape, military bandages, latex gloves, liquid skin, painkillers, stomach meds, tourniquets, antibiotic ointment, cold compresses, eyedrops, and extra prescription meds. Also consider hemostatic agents like Bleedstop and QuikClot (for severe injuries). Use QuikClot first, then add Bleedstop for additional clotting. Using the Bleedstop powder first can interfere with gauze clotting.

Types of Bags



Everyday Carry (15-20L)

For emergency medical kit, gas mask, a bottle of water or two, flashlight, multitool, other small items, 1-2 meals. For shorter durations. First responder and patrol bags work well.



Tactical Backpack (20-30L)

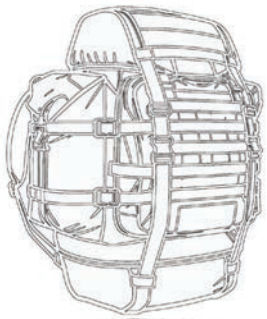
Can hold all items plus 2 1-liter bottles of water and 1-2 days of meals for one person. Good for short bugout, looking for a place to stay in another city. Basically a bookbag with pouches.

15-20 lbs (7-9kg)



Rolling Suitcase (40-50L)

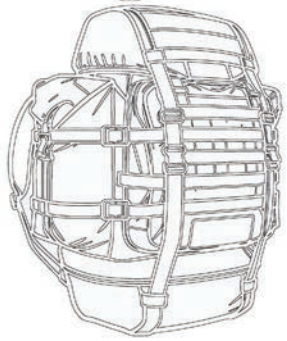
Can hold all items plus a solid 2 days of food and water. Good for longer bugouts. Good for car camping and emergency road trips. Also good for saving your back.



Medium Backpack (40-60L)

Can hold all items plus 3 days of meals for one person. A heavier bugout bag meant for longer bugouts and emergencies where food and water will be scarce.

40-50 lbs (18-22kg)

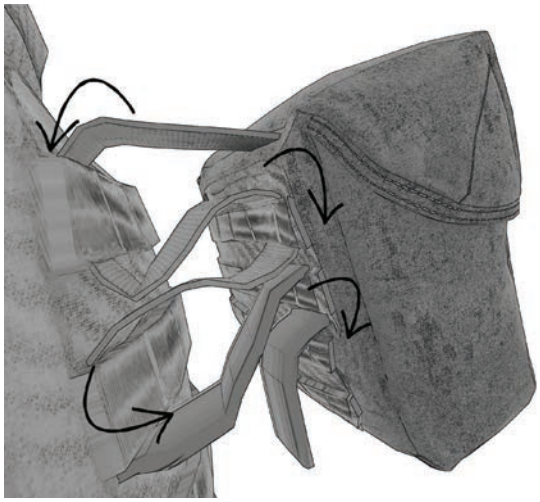


Large Backpack (60-80L)

Can hold all items plus 4-5 days of meals for one person. A very heavy backpack meant for longer term emergency situations.

How to Use MOLLE





MOLLE means modular lightweight load-carrying equipment. MOLLE packs and vests let you weave smaller pouches onto the back or sides. That way, you can expand your carrying capacity without having to buy an entire new bag.

MOLLE pouches are good for emergency medical kits, water filters, gas masks, or other items that you might want to access without having to dig through your bag. You can also get MOLLE water pouches.

MOLLE vests and fanny packs let you carry tools, cash, or energy bars. They're a good addition for a light bugout bag or a camel pack. With a MOLLE system, you have more options to scale up and down your bugout plan. Many preppers love them.

What Fits in a Car?



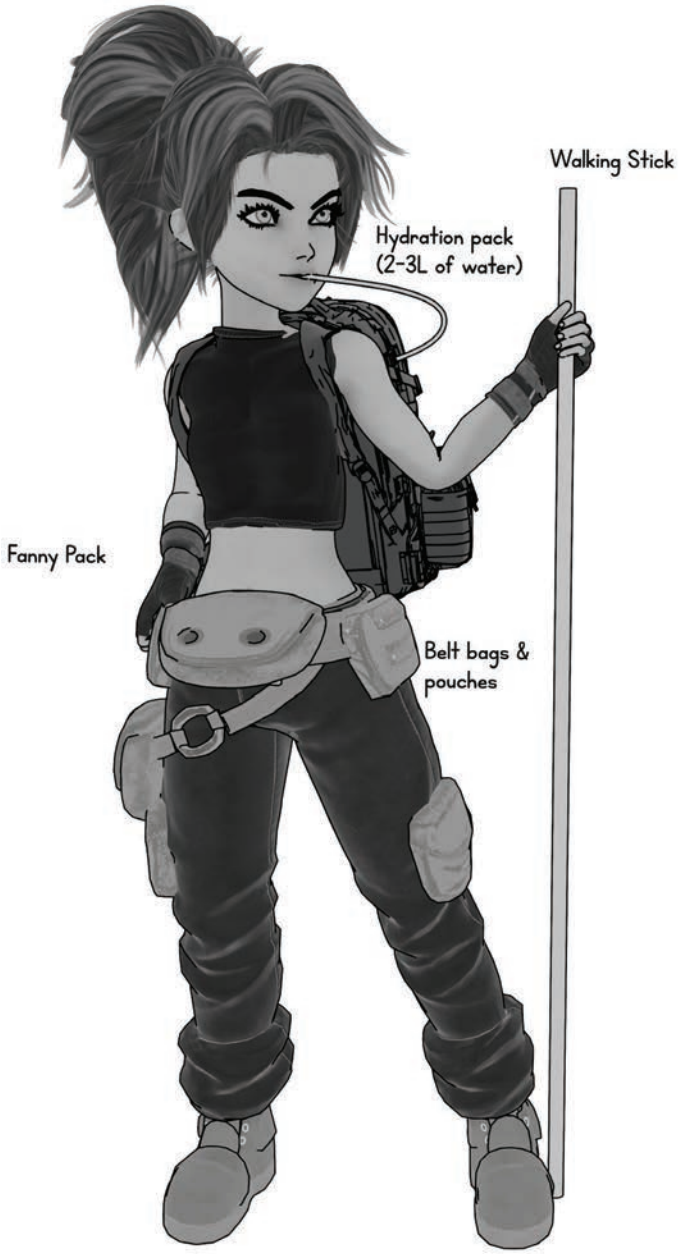
Even a smaller compact car can usually fit two 60-85L bags and two 20-30L bags in the trunk. That leaves room in the cabin for people and personal items. Someone can hold a first responder bag in their lap.

You'll also want to think about room for pets and pet carriers, baby carriers, walkers, and other items you'll be taking.





Bugging Out on Foot



Pro-tip: Trying to drink your own urine will only dehydrate you faster. Don't do it!

Not everyone has a car. Not everyone will be able to get to it in time.

Sometimes, you're much better off bugging out on foot if you can. Roads and highways can back up with traffic. They can turn into their own disasters.

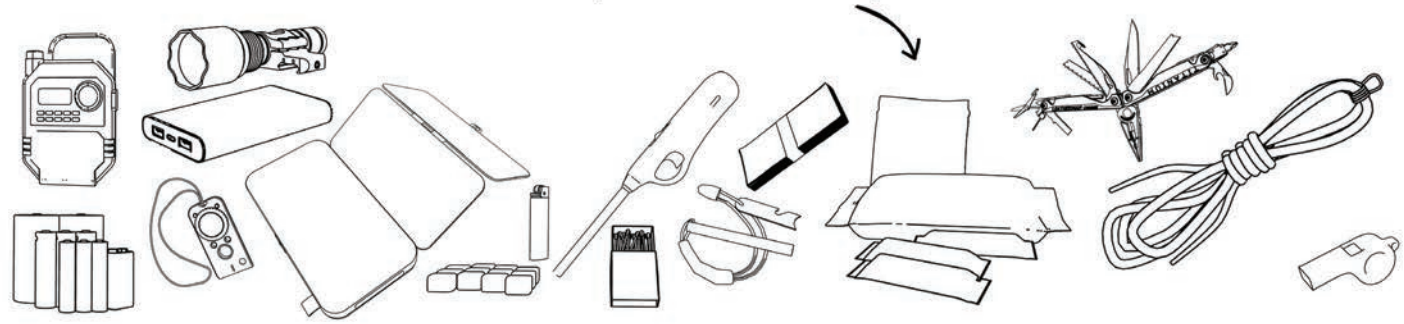
You might have to leave your car behind if things go from bad to worse.

Some preppers keep a smaller ejection pack in their larger bugout bags, or they just take a hydration (camel) pack with them everywhere they go. They're light. Some of them still hold 15L-20L of other gear. If you can't or don't want a bunch of extra weight, it's a good way to go.

Water is by far the most important thing you'll need during a major emergency. You can go days without food. You can find or make shelter. Your walking stick can double as a weapon. The one thing you can't go long without is... water.

Hydration packs distribute the weight better than water bottles, but you can pack a couple of those too, especially with filters or filter adapters.

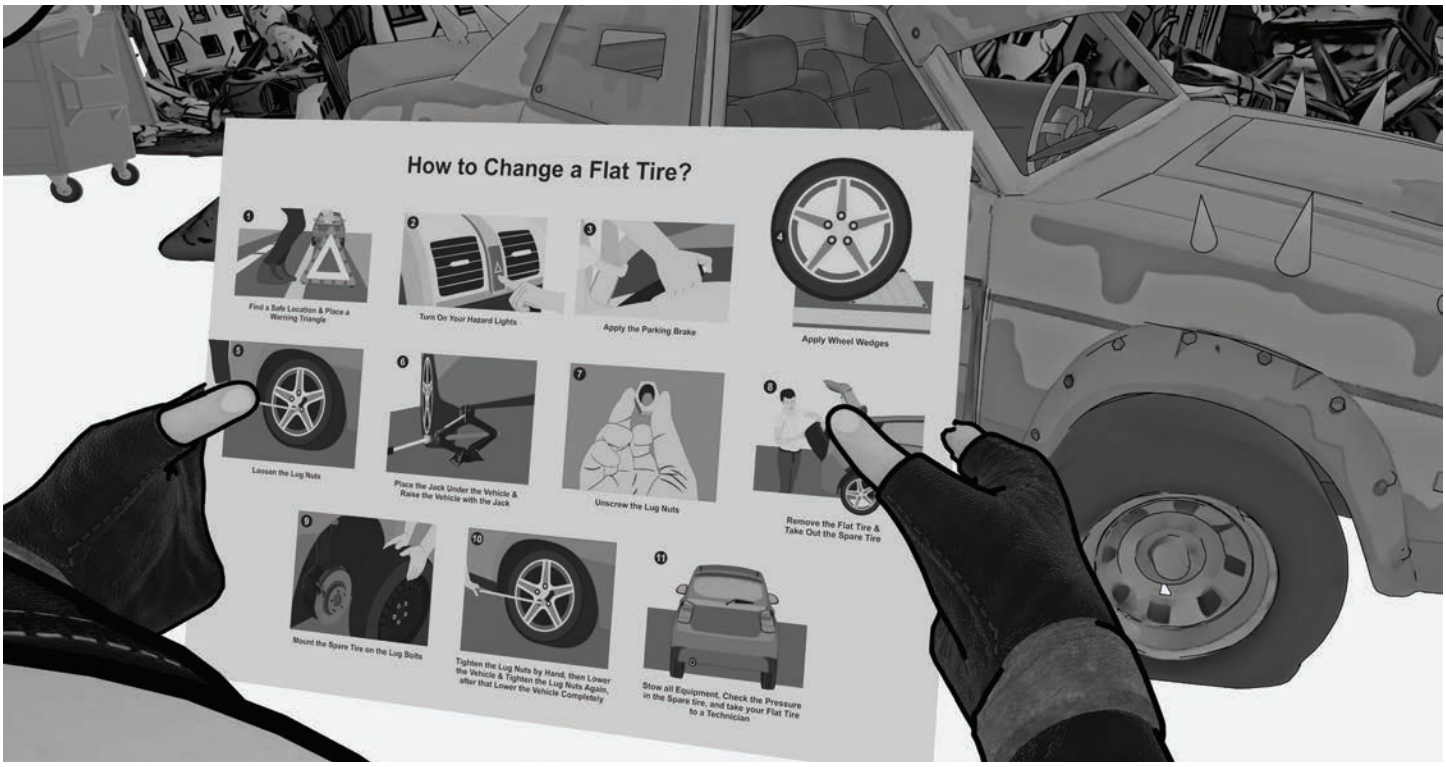
You can fit a lot of this into pouches and smaller packs



Changing a Flat Tire



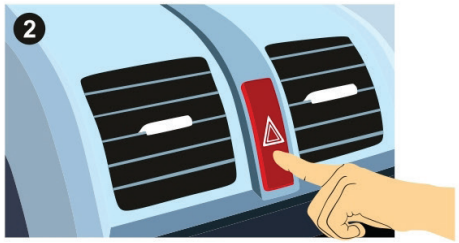
Even during a major disaster, ordinary skills will come in handy. Sometimes, they're the most important.



How to Change a Flat Tire?



Find a Safe Location & Place a Warning Triangle



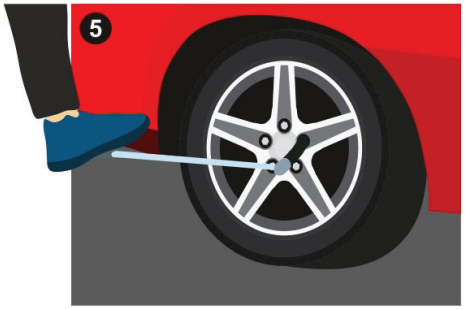
Turn On Your Hazard Lights



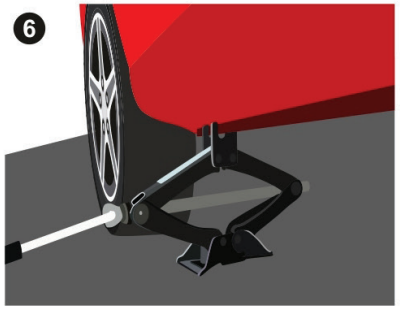
Apply the Parking Brake



Apply Wheel Wedges



Loosen the Lug Nuts



Place the Jack Under the Vehicle & Raise the Vehicle with the Jack



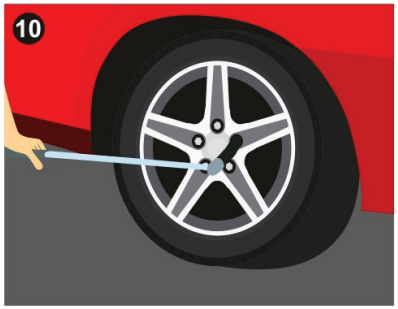
Unscrew the Lug Nuts



Remove the Flat Tire & Take Out the Spare Tire



Mount the Spare Tire on the Lug Bolts



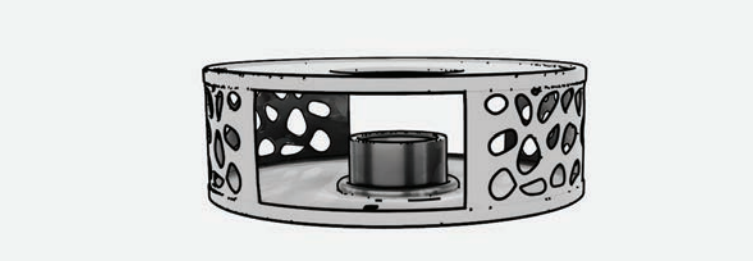
Tighten the Lug Nuts by Hand, then Lower the Vehicle & Tighten the Lug Nuts Again, after that Lower the Vehicle Completely



Stow all Equipment, Check the Pressure in the Spare tire, and take your Flat Tire to a Technician

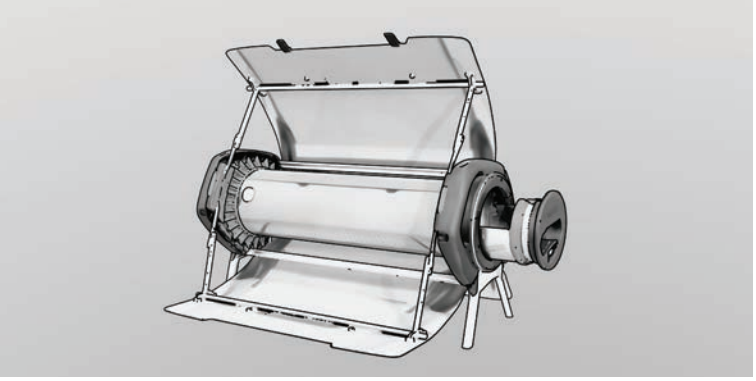
Cooking During an Emergency

Even if you have emergency food and water, you'll need a way to cook it during a power outage. You have a few options beyond propane stoves. You can use folding camping stoves with fuel tablets, but you'll need ventilation. You can also try these options:



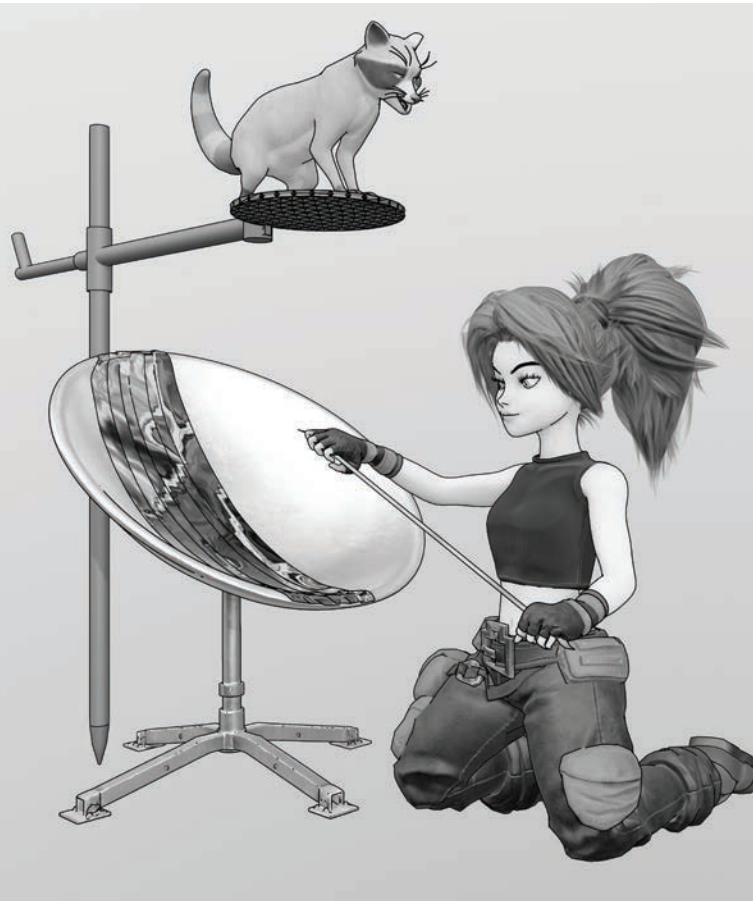
Tea Candles & Ovens

You can find tea candle ovens or teapot warmers fairly easily. It's enough to heat water for cooking. Use 3-6 candles together to boil water.



Portable Solar Cookers

Portable solar cookers cost a little more, but they can consistently cook food if you have an area where you can cook in direct sunlight. Larger ones work well if you're sheltering in place, and companies like Go Sun make smaller, portable ones. Some of them can also plug into a power source.



Parabolic Solar Cookers

You can buy parabolic solar cookers online that heat larger amounts of food even faster. You can also make your own if you can find a used satellite dish, anywhere from 3-5 feet (1-2 meters) in diameter. Cover it in reflective foil or mylar. You can find tape that does the job. Use a swivel or swing-away grill to hold your pots/pans above the parabolic cooker's focal point.

Calculating Focal Point

The focal point refers to the area where light converges above the dish. It's where your food will reach the highest cooking temperature the fastest. You can find it by holding a sheet of paper over the dish and moving it until you find the hottest point. (It will start to smoke or burn.) You can also use this formula: $Diameter^2/16xdepth$.

Emergency Medicine 101



So something terrible has happened, and you've got injured folks.

Where do you start? CMS Check (Circulation, Motor, Sensory).

Check their pulse, respiration rate, and blood pressure if you can. Feel their pulse for 10 seconds to get a baseline. Are they breathing fast, slow, not at all? Also assess their mental state. Are they with it? Can they answer basic questions like their name or what day it is? Are they cold, warm, sweating? Bleeding? Check for blueness on the extremities. Also check for swelling. If they seem weak or incoherent, keep them on the ground.

Can they feel everything? Can they move everything?

CPR

CPR: Cardiopulmonary Resuscitation. It can triple someone's chances of survival.

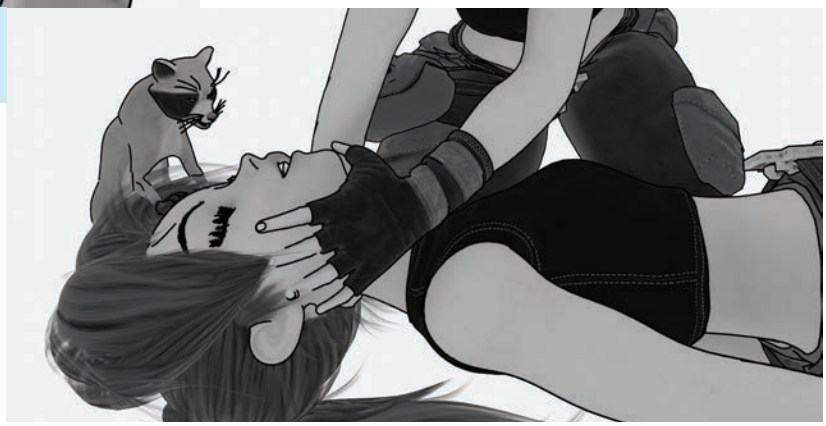
1. Inspect the scene. If it's safe and they're not breathing, it's time for CPR.

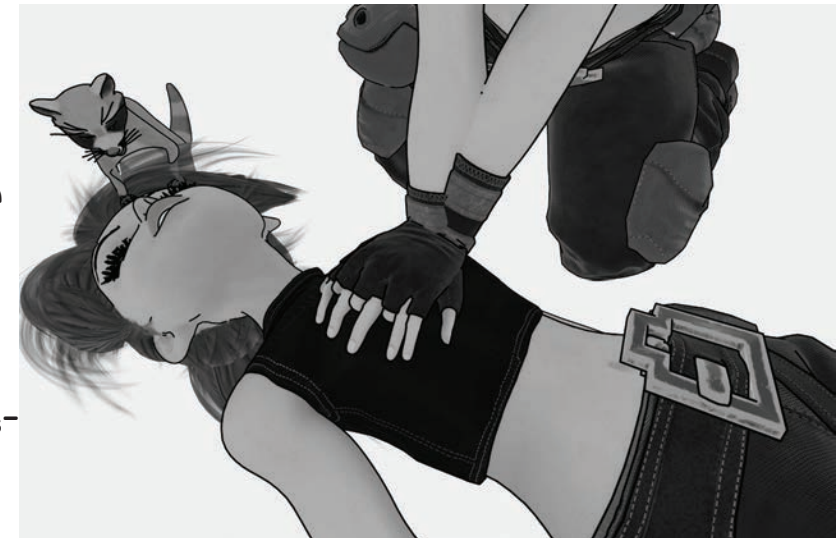
2. Tilt their head back. You don't have to give them breaths, but you can. Give them 2 breaths for 30 compressions. If you have a resuscitation mask (CPR pocket mask), use it.

3. Put the heel of one hand in the middle of their chest. Weave the other hand on top. Keep your elbows straight.

4. Push down 2-2.4 inches but don't go any further. Use your body weight.

5. Emulate a heartbeat, 100-120 compressions per minute.





Heimlich Maneuver



Believe it or not, choking is one of the leading causes of accidental death in the U.S. Nearly 6,000 people choke to death any given year. Meanwhile, the Heimlich maneuver has saved at least 100,000 lives.

How do you do it?

1. Stand or kneel behind the person. Wrap your arms around their waist.

2. Make a fist with one hand and hold it just above their belly button. Cover the fist with your other hand.

3. Thrust upward until they cough up whatever's been choking them.

If the person is pregnant, position your hands around their chest, in the middle of their sternum.

You can do the Heimlich on yourself too, either with your fist or while leaning your upper belly against the edge of a table or chair.

Blood Pressure

It's gotten a lot easier to take someone's blood pressure over the last several years. You can buy blood pressure monitors with digital readers. (We'll cover the old school, analog method in a minute.) These devices also display heart rate and more.

Understand the numbers:

Normal Systolic (Top Number): 120-129
Hypertension: 130 and Above

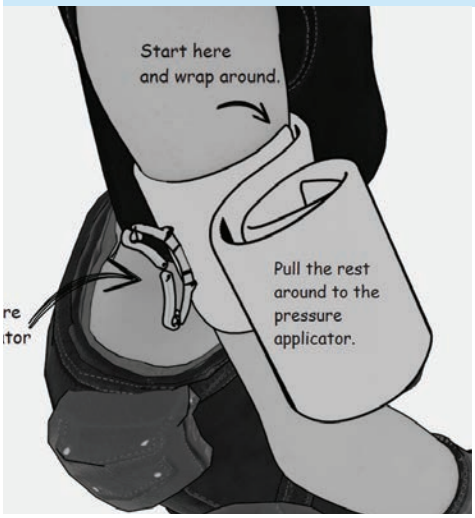
Normal Diastolic (Bottom): 80
Hypertension: 80 or above

Higher readings don't always mean hypertension, especially during disasters and emergencies. Here, look for low blood pressure that signals internal bleeding, dehydration, or other problems.

A blood pressure above 180 or edging toward that can indicate a heart attack or stroke.

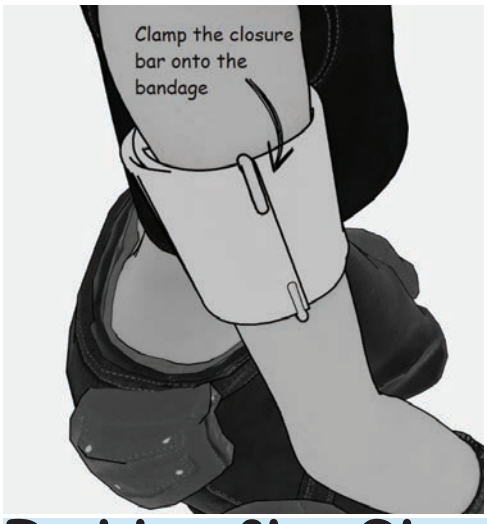


Israeli Bandages & More







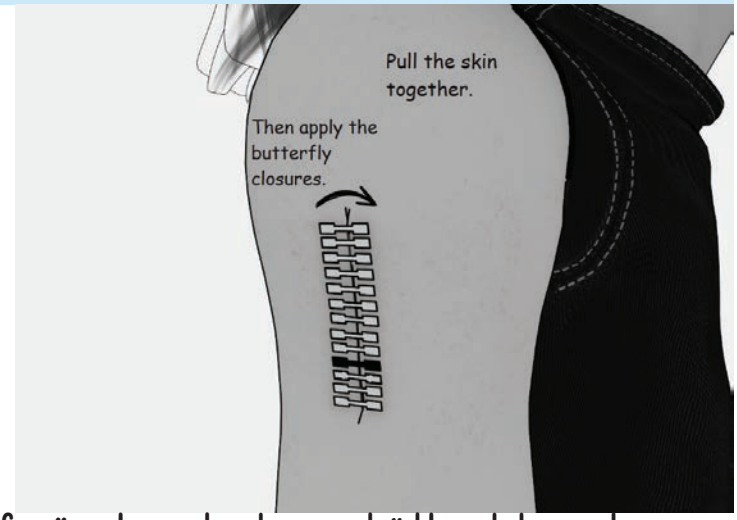


When someone's losing catastrophic amounts of blood, you tie a tourniquet above the wound to completely stop the bleeding. It's dangerous, and you generally can't use one for more than 2 hours. Israeli Bandages work on serious but less catastrophic wounds when you want to preserve blood flow while still protecting the injury.

You can turn shirts and other pieces of cloth into makeshift tourniquets, but Israeli bandages have a special design that makes them superior for serious but manageable wounds. They can stay on for several hours. You can use them almost anywhere, and they work on gunshots.

Butterfly Closures

Butterfly closures work well on shallower cuts once you've already used pressure to stop the bleeding. You keep boxes of them on hand in order to conserve heavier bandages and gauze. Simply hold the wound closed and then apply the closures.



Some brands of Butterfly closures come with straps to help pull the skin tighter. You can make these yourself with tape. Just cut a strip in the middle and fold the edges down to make the bridge.

Don't forget Chest Seals: These are important for "sucking chest wounds" like stabs and gunshots. You need them because deep chest wounds can cause lung problems. They're vented to allow one-way air escape. Flush the wound, sterilize, and then slap it on.

Tourniquets

This PSA from Homeland Security demonstrates the proper way to apply a tourniquet. (Why reinvent the wheel?) You can improvise one from cloth and screwdrivers, etc.

Applying a Tourniquet

A wound on the leg or arm that won't stop bleeding is a good candidate for a tourniquet.

Step 1:
Stop the bleeding. *Now!*

Expose the wound. Tear clothing away. Immediately apply firm, direct pressure to the wound using gauze, clean cloth, an elbow, hand, or knee — whatever it takes to slow or stop the hemorrhage. If the pressure does not stop the bleeding, and the dressing becomes soaked with blood, you will need to apply a tourniquet.



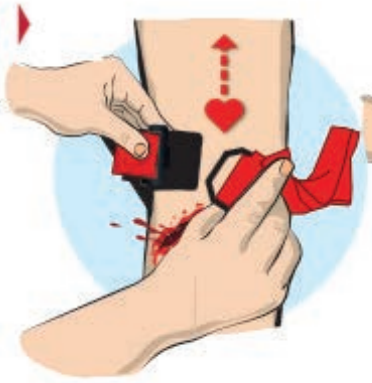


Step 2:
Apply the Tourniquet

If the bleeding doesn't stop, place a tourniquet at least 2-3 inches from the wound. The tourniquet may be applied and secured over clothing.

Step 3:
Adjust the tourniquet.

Be sure the tourniquet is at least 2-3 inches from the wound. The tourniquet should be placed between the wound and the heart. Do not apply a tourniquet over a joint, such as an elbow, knee, wrist, or ankle. (Joints protect blood passageways and prevent the pressure needed to stop an arterial bleed.)





Step 4:
Manually tighten the tourniquet

Clip the sides of the tourniquet together using the buckle and pull firmly on the end strap. Tighten it as much as you can.

Step 5:
Use the windlass rod to further tighten the tourniquet.

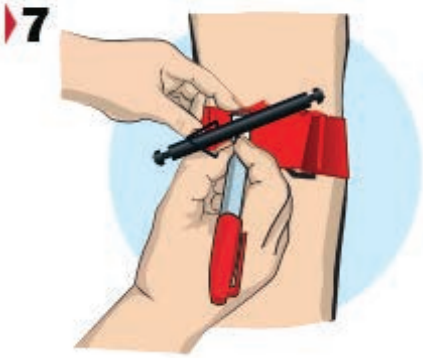
Twist the windlass rod in one direction to increase the pressure and stop the bleeding.





Step 6:
Secure the windlass rod.

Using the windlass clip, secure the rod so that it does not unwind. If there is a velcro strap, also use that to secure the windlass.

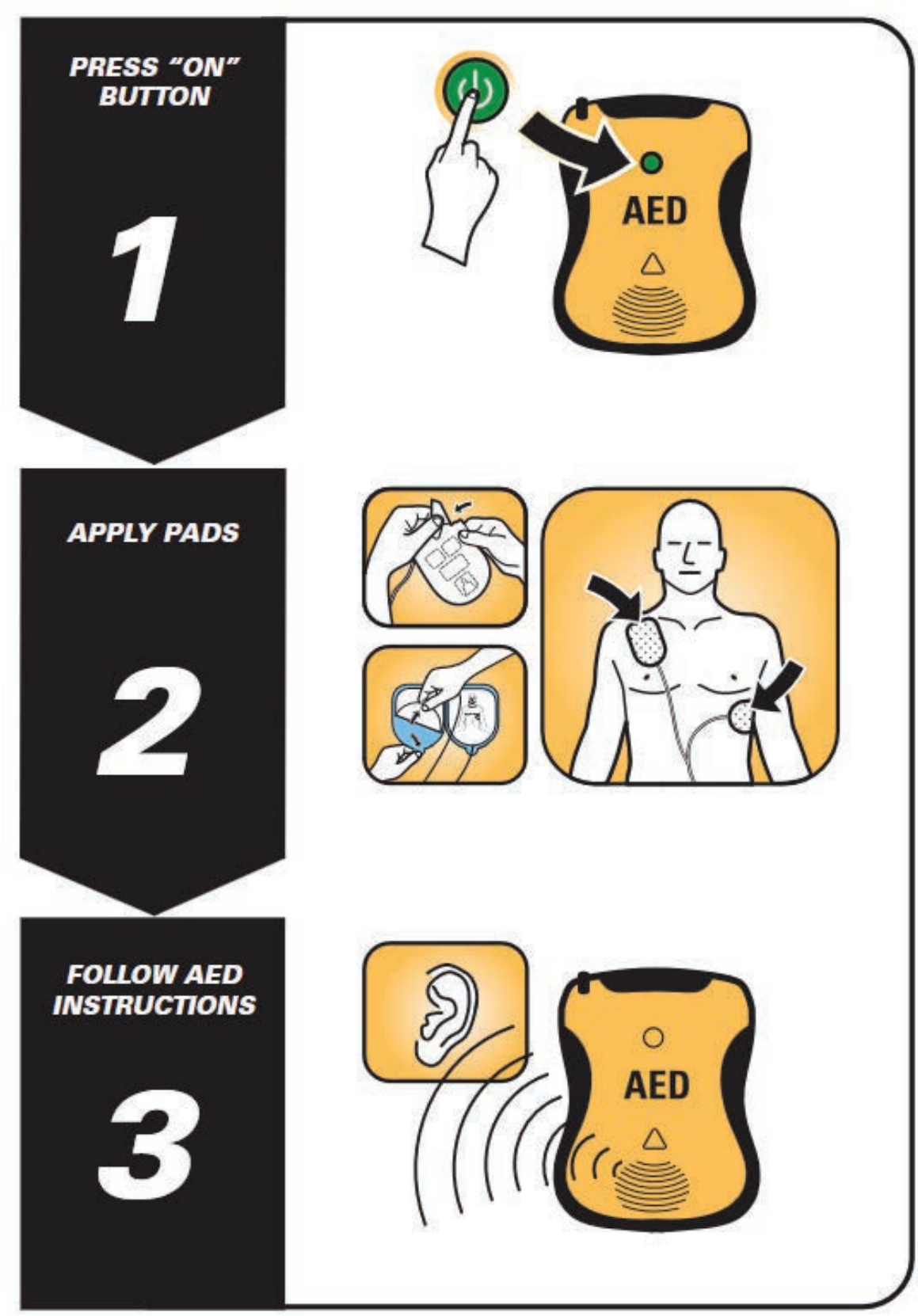


Step 7:
Make a note of the time.

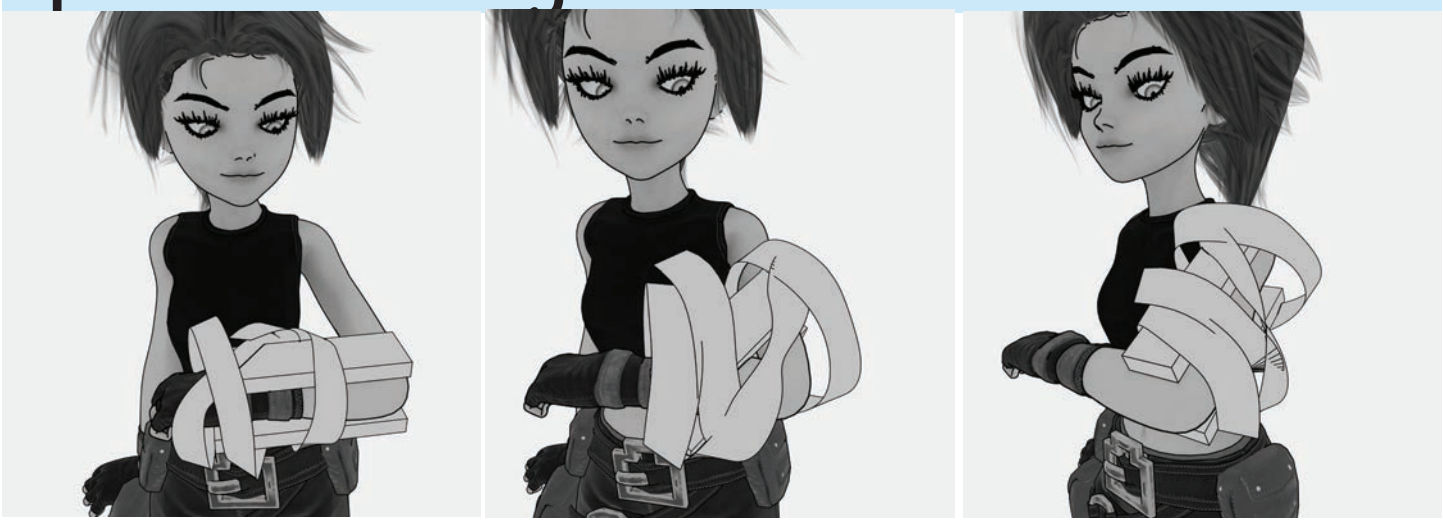
Note the time that the tourniquet was applied. This is important because leaving a tourniquet on too long can cause damage to the tissue. A time-stamp will help care-givers know which patients to treat first.

AED: Automated External Defibrillator

If someone shows signs of a cardiac arrest, deploying an AED in the first minute leads to a 90 percent survival rate. They're basically idiot proof. They tell you exactly what to do. This is one survival tool medical professionals want civilians to have. From the FDA:



Splints and Slings



Splints and wraps help immobilize breaks and sprains. You can find several different types of splints to have in stock, including flexible SAM splints as well as padded splint boards from various medical retailers. You can improvise splints with any rigid material, including poles and branches. If you're improvising, make sure to pad the splint. You can use pillows, blankets, and clothing items to provide cushioning.



The splint needs to be long enough to protect the fracture, either at the forearm, elbow, or upper arm. You can use wraps to create swathes across the upper body for added protection on arm fractures. For legs, longer splints are better. If someone breaks or sprains their ankle, then splint the ankle. Wrap at the ends. Before and after, do a CMS check (circulation, motor, sensory). Take a pulse at finger and toes. Make sure they can wiggle them. Make sure they can feel.

For bad breaks and sprains, it's possible for a civilian to set bones and use traction splints as long as you undergo training. You'll need more than a standard first-aid course, but you can find EMT courses and wilderness medical courses in your city. They'll train you in more advanced methods for treating these kinds of injuries.

Don't try to set a bone if you're not trained. It's a popular and incredibly destructive movie myth. If you try to jolt a bone back into place, you risk injuring tendons, clipping nerves, and even damaging arteries in ways that cause internal bleeding, especially for larger bones like femurs.

Emergency Medical Kits



It's a good idea for everyone in your group to keep a small medical kit with basic items. You can keep some of these items in a family kit, as well as extra supplies. You can store medical kits in bugout bags, cars, and cabinets. Kits stored in cars will need more frequent inspection and rotation, because of heat/cold exposure.

We're going to take the guesswork and arbitrary nature out of medical kits by starting with ANSI/ISEA Z308.1 as a baseline. (American National Standards Institute/International Safety Equipment Association). Here's ANSI's full Class B list for high-risk situations, plus additions from medical prepping and survival experts:

Wound Care & Dressings

* Adhesive Bandages (50) 1x3 in. Band-Aid (Flexible Fabric)
* Sterile Gauze Pads (10) 3x3 in. & 4x4 in. – Dukal
* Trauma Pads (4) 5x9 in. – Dynarex
* Rolled Gauze Bandage (2 rolls) 2 in. x 4 yd. – Kerlex (Covidien)
* Rolled Gauze Bandage (2 rolls) 4 in. x 4 yd. – Kerlex (Covidien)
* Steri-Strips / Butterfly Closures (10) – 3M (Steri-Strip)
* Medical Glue / Liquid Skin (1 tube) – New-Skin (or Dermabond for clinical grade)
* Suture Kit (2 sterile packs) – Ethicon
* Triangular Bandages (2) 40x40x56 in. – North American Rescue

Major Trauma & Bleeding Control

* Tourniquets (2) min. 1.5 in. wide – North American Rescue (CAT Gen 7)
* Israeli / Compression Bandages (2) 4 in. or 6 in. – PerSys Medical (The Emergency Bandage)
* Hemostatic Gauze (2 packs) – QuikClot (Combat Gauze)
* Chest Seals (2 twin-packs) vented – HyFin (North American Rescue)
* SAM Splint / Padded Splint (2) 4x24 in. or 36 in. rolled – SAM Medical (SAM Splint)

Burns, Antiseptics & Topicals

* Antibiotic Ointment (25 packets) 1/57 oz. – Neosporin
* Antiseptic / Alcohol / Betadine Wipes (50 packets) – PDI (BZK & Alcohol Prep Pads)
* Burn Dressing, Gel-Soaked (2) 4x4 in. – Water-Jel
* Burn Gel / Treatment (25 packets) 1/32 oz. – Water-Jel
* Silvadene / Burn Cream (1 tube) – Silvadene (prescription) or Burn Jel Plus (OTC)
* Lidocaine / Pain Relief Cream (1 tube) – Aspercreme (4% Lidocaine)

Emergency Medical Kits

* Hydrocortisone Cream (1 tube) – Cortizone-10
* Sting Relief Wipes (10 packets) – Safetec
* Hydrogen Peroxide / Liquid Antiseptic (1 bottle) 4 fl. oz. – Hibiclens (Chlorhexidine) or Swan (Peroxide)

Eye, Skin & Hygiene

* Eye / Skin Wash & Saline Solution (1 bottle) 4 fl. oz. – Bausch + Lomb (Advanced Eye Relief)
* Eye Coverings (2) 2.9 sq. in. with attachment – 3M (Nexcare)
* Hand Sanitizer (20 packets or 1 bottle) – Purell
* Cotton Swabs / Q-Tips (25) – Q-Tips
* Cotton Balls (15) – Swisspers
* Foot Powder / Baby Powder (1 travel bottle) – Gold Bond
* Insect Repellent (1 bottle/spray) – Sawyer (Picaridin)
* Sunblock (1 bottle) – Neutrogena (Ultra Sheer)
* Biohazard / Disposal Bags (4) – Safetec

Airway, PPE & Diagnostics

* Nitrile / Non-Latex Exam Gloves (6 pairs) – North American Rescue (Black Talon)
* N95 Respirator Masks (4) – 3M (Aura 9205+)
* CPR Pocket Mask / Breathing Barrier (1) – Laerdal (Pocket Mask)
* Thermometer (1) digital – Braun
* Pulse Oximeter (1) – Zacurate (Pro Series 500DL)
* Blood Pressure Cuff & Stethoscope (1 set) – Littmann (Stethoscope) & ADC (BP Cuff)

Medications & Hydration

* Painkillers (20 tablets) Acetaminophen & Ibuprofen – Tylenol & Advil
* Antacids / Anti-Diarrheal / Stomach Meds (12 doses) – Imodium & Pepto-Bismol
* Extra Prescription Medications (7-14 day supply) – Personal Prescription
* Oral Rehydration Electrolyte Packs (10 packets) – Liquid I.V. or DripDrop
* Water Purification Tablets (50 tablets) – Aquamira or Potable Aqua
* Nutrition Drinks / Emergency Rations (2-4) – Ensure (Drinks) or Datrex (Bars)
* Multivitamins (14-day supply) – Centrum

Tools, Tape & Survival Gear

* Medical / Trauma Shears (1) – Leatherman (Raptor) or NAR (Trauma Shears)
* Tweezers (1) fine-point stainless steel – Uncle Bill's (Sliver Gripper)
* Irrigation Syringe (1) 20cc or 35cc with 18g tip – Monoject
* Adhesive Medical Tape (2 rolls) 2.5 yd. total – 3M (Transpore or Durapore)
* Duct Tape (1 flat-pack roll) 5-10 yd. – Gorilla Tape
* Cold Packs (2) 4x5 in. – Dynarex
* Foil / Mylar Solar Blanket (2) 52x84 in. – SOL (Survive Outdoors Longer)
* Headlamp / Flashlight (1) with spare batteries – Petzl or Black Diamond
* Magnifying Glass (1) – Carson
* Bilingual First Aid Guide (1) English & Spanish – American Red Cross

Emergency Medical Kits

Advanced/Community Items

If you're facing an emergency as a group, a family, or a community, you can add some advanced items to your kit.

* Portable Automated External Defibrillator / AED (1 unit) – ZOLL (AED Plus) or Philips (HeartStart OnSite)
* Bag Valve Mask / BVM Resuscitator (1) – Ambu (SPUR II)
* Manual Suction Pump (1) – Laerdal (V-VAC)
* Nasopharyngeal Airway / NPA Kit (assorted sizes 24F-32F) – Rusch (surgical lube packets)
* Oropharyngeal Airway / OPA Kit (assorted sizes) – Berman
* Wound Packing Gauze (2-4 rolls) – North American Rescue (Compressed Gauze)
* Junctional / Abdominal Tourniquet (1) – SAM Medical (SAM Junctional Tourniquet)
* Eye Shield, Rigid Aluminum/Polycarbonate (2) – Fox Eye Shield
* Decompression Needle / ARS (1-2) – North American Rescue (ARS 14g x 3.25 in.)
* Epinephrine Auto-Injector (2-pack) – EpiPen or Auvi-Q (prescription)
* Naloxone Nasal Spray (2 doses) – Narcan (OTC)
* Glucose Gel / Tubes (3 tubes) – Insta-Glucose
* Aspirin, Chewable 81mg (1 bottle) – Bayer
* Portable Blood Glucose Meter & Strips (1 kit) – OneTouch (Verio Flex)
* Otoscope / Penlight Diagnostic Set (1) – Welch Allyn
* Triage Tags & Waterproof Casualty Cards (10 pack) – North American Rescue (T2 Tag)



Stockpiling Antibiotics (If You Must...)

It's not a good idea to hoard antibiotics. In many cases, it's not even possible. However, if you truly want to build a small stockpile for a community, ways exist. Companies like Jase Case and Amble Health sell kits with prescription meds provided you consult with an online doctor. In some cases, they even prescribe EpiPens and other epinephrine auto-injectors. There's another method that medical professionals frown on, but the Altons explore it in their book *The Ultimate Survival Medicine Guide*. They recommend:

Fish Mox (amoxicillin 250-500 mg)
Fish Cillin (ampicillin 250 mg)
Fish Flex (Keflex 250-500 mg)
Fish Zole (metronidazole 250 mg)
Fish Pen (penicillin 250-500 mg)
Fish Cycline (tetracycline 250 mg)
Fish Flox (ciprofloxacin 250 mg)
Fish Cin (clindamycin 150 mg)
Bird Biotic (doxycycline 100 mg)
Bird Sulfa (sulfamethoxazole 400 mg or Trimethoprin 80 mg)

Some good news on expiration dates: The FDA and Dept of Defense routinely extend the shelf-life of many antibiotics 5+ years for use in strategic stockpiles. One major exception: Tetracycline, dangerous when expired. You must keep these meds stored in a cool, dry place between 68-77F (20-25C). They can tolerate brief deviations up to 86F (30C) or down to 59F (15C).

Warning: Taking antibiotics when you don't need them creates extreme risk during a disaster. You can obliterate natural gut flora and make yourself more vulnerable to other infections and injuries. If you're going to store antibiotics, keep them completely sealed and give them to paramedics or anyone with medical training when a crisis hits who has the tools to run official diagnostics.

Our philosophy: Knowing more about antibiotics and their uses can encourage people to make more responsible decisions about them and to avoid "panic" stocking.

Top Picks & Information

Amoxicillin

Works on: Anthrax, Chlamydia, Urinary Tract Infection, Helicobacter Pylori, Lyme Disease, Ear Infections, Skin Infections, Pneumonia, Sinusitis, Skin Infection, Actinomycosis, Bronchitis, Tonsillitis, Pharyngitis (Strep Throat)

Dose: For moderate infections, 500 mg 2x a day, or 3x a day for serious infections, 5-10 days for moderate infections, 7-14 days for severe infections. Take with or without meals. For children under 100 lbs (45kg), 20-45 mg/kg split into 3 doses over 24 hours.

Side effects: Nausea, vomiting, diarrhea, rash, yeast infection.

Expiration: Routinely extended 5+ years for strategic stockpiles.

Ampicillin

Works on: Severe Bacterial Meningitis, Endocarditis, Septicemia, Salmonella, Shigella, E. coli, Listeria, Monocytogenes, Severe Bacterial Pneumonia, Sinus, Throat Infections.

Dose: 250 mg every 6 hours for 3-5 days until symptoms clear. For urinary tract infections, 10-14 days. For children under 100 lbs (45 kg), 50 mg/kg split into 4 doses over 24 hours, 7-10 days or up to 14 days for urinary tract infections. Take on empty stomach.

Side effects: Stomach pain, rash, oral thrush or black tongue.

Expiration: Routinely extended 5+ years for strategic stockpiles.

Azithromycin (Z-Pak)

Works on: Bronchitis, Pneumonia, Ear, Skin, Throat Infections including Strep Throat, Sinusitis, Tonsillitis, Gonorrhea, Typhoid, Chlamydia, Lyme, Mycobacterium Infections, Whooping Cough.

Dose: 500 mg 1x per day for 3 days for standard infections. 500 mg for 1 day then 250 mg for 2-5 days for more severe infections. 1,000 mg in a single dose for Chlamydia. For children under 100 lbs (45 kg), 10 mg/kg for 1 day then 5 mg/kg for 2-5 days. Take on empty stomach, and avoid taking with antacids like Mylanta.

Side effects: Stomach ache, dizziness, fatigue, changes to sense of taste/smell.

Expiration: Routinely extended 5+ years for strategic stockpiles.

Ciprofloxacin

Works on: Weaponized Anthrax, severe cases of E. coli, Salmonella, Shigella, Bronchitis, Kidney and Urinary Tract Infections, Plague. Does not work on common respiratory infections.

Dose: 250-500 mg, 2x per day, 7-14 days for moderate infections, 28-60 days for severe infections. Not recommended for children, or 10-20 mg/kg 2x per day max. Avoid taking with calcium supplements or foods that are rich in calcium.

Side effects: Tendon rupture and nerve damage.

Expiration: Routinely extended 10+ years for strategic stockpiles.

Clindamycin

Works on: Pneumonia, Blood Infections, Dental Infections, Staph Infections, Osteomyelitis, Uterine Infections, Pelvic Infections, Strep, Pneumonia, PID, MRSA, Malaria, Toxoplasmosis, Anthrax.

Standard Dosage: 300 mg 3x per day, 450 mg 3x per day for severe case, 10-14 days and 6 weeks for chronic bone infections. For Strep infections, 300 mg, 2x per day, 10 days minimum. For children under 100 lbs (45 kg), 5-8 mg/kg, split into 3 doses over 24 hours, same durations.

Side effects: Stomach ache, nausea, vomiting, rash, genital irritation.

Expiration: Routinely extended 5+ years for strategic stockpiles.

Doxycycline

Works on: E. coli, Shigella, enterobacter, chlamydia, Lyme, Rocky Mountain Spotted Fever and other Tick-Borne Illnesses, Anthrax, Cholera, Malaria Prevention, Plague

Dose: 50-100 mg 1x per day for standard infections and malaria prevention, 200 mg for tick-borne illnesses on first day then 100 mg for 3-14 days. For children under 100 lbs (45 kg), 4.4 mg/kg on first day then 2.2 mg/kg per day for moderate infections. For severe tick-borne illnesses, give them 2.2 mg/kg every 12 hours. Do not lie down for 30-60 minutes after taking.

Side effects: Nausea, vomiting, stomach pain, diarrhea, yeast infections, sensitivity to sun.

Expiration: Routinely extended 5+ years for strategic stockpiles.

*For children, you calculate dose by multiplying their weight in kg x the dose measured in mg/kg. For example, if a child weighs 44 lbs, divide by 2.2 to get their weight in kg. If their dose is 5 mg/kg, then multiply by five. 20kg x 5 = 100 mg.

Keflex (Cephalexin)

Works on: Throat Infections, Strep Infections, UTIs, Bladder Infections, Moderate Respiratory Infections, Pneumonia, Sinusitis, Osteomyelitis, Ear Infections.

Dose: 500 mg 2x per day, 7-10 days for moderate infections. For severe infections, up to 2,000 mg 2x per day. For Strep and other severe infections, 10 days minimum. For children under 100 lbs, 25-75 mg/kg split into 2-4 doses over 24 hours, same durations.

Side effects: Diarrhea, nausea, vomiting, stomach pain, headaches, dizziness, and yeast infections

Expiration: Routinely extended 5+ years for strategic stockpiles.

Metronidazole

Works on: Many STDs, Vaginosis, Dysentery, Water-borne parasitic infections like Giardia.

Dose: 500-750 mg 3-4x per day for moderate infections, 5-10 days. For children under 100 lbs (45 kg), 35-50 mg/kg split into 3 doses over 24 hours, 10 days. Do not ever take with alcohol.

Side effects: Metallic taste, nausea, vomiting, diarrhea, loss of appetite, furry tongue, headaches, dizziness.

Expiration: Routinely extended 5+ years for strategic stockpiles.

Deadly Disaster Fallacies from Hollywood

Someone who trained for disasters by watching movies will offer little or no help during a real emergency. Here's a list of things the movies get wrong. Sometimes, it's knowing what not to do that saves someone's life. Impress your friends:

Do not ever try:

*To dig a bullet out of someone. It's the blood loss that kills, not the projectile.

*Removing an impaler. It's often the knife, arrow, or pole keeping the wound stable and preventing massive blood loss.

*Suck snake poison out of someone. It doesn't work. Meanwhile, your mouth contains a lot of bacteria.

*Cauterizing a wound. It won't work, and it will create layers of dead tissue that feed bacteria.

*Using chest paddles on a flatline. It doesn't work. It's pure cinema.

*Rubbing frost bite. It causes tissue damage. Gradually rewarm the skin and be ready for pain as feeling returns.

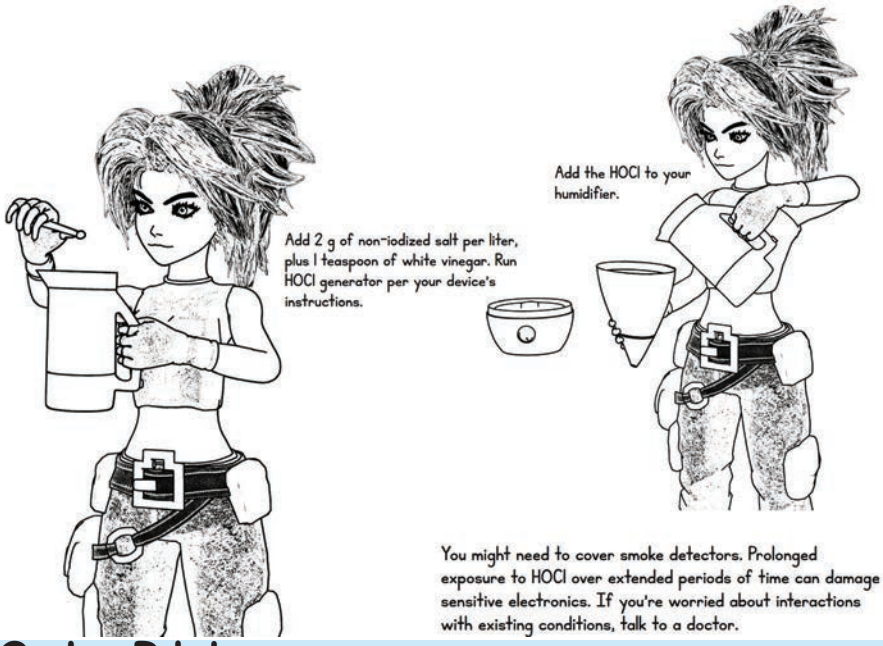


Ways to Treat a Viral Infection

Vaccines, air purifiers, and N95 masks (or higher) offer the best protection against viruses. If you're sick, seek medical attention. That said, other nontraditional treatments can help combat viral infections. This guide covers some of the most common ones. It strives to provide accurate information, but double check conflicts with other medications or dietary restrictions and use your own judgment.

Hypochlorous Acid (HOCl)

A 2025 article in "Viruses" confirms the potential of hypochlorous acid (HOCl) steam as a "promising respiratory antiseptic" for "therapeutic inhalation" to reduce viral load and help clear infections. The human body already produces HOCl to fight germs. Use a HOCl generator to make it at 100-200 ppm. Pour it into a humidifier. It's safe at levels 300 ppm and below. Use it like a regular humidifier, 3-4 times a day. Many users report breathing HOCl for hours a day (or at night) while sick.



Ginko Biloba

Contains quercetin and rutin that show broad antiviral and antibacterial properties. Studies have specifically shown it blocks Covid from infecting cells.

Dose: 500-600 mg, 1 gram max per day

Brands: Life Extension, Solaray, BulkSupplements.com, Swanson.

Durations vary, but average 1-2 weeks. Be careful when mixing Ginkgo, elderberry, echinacea, and St. John's Wort. They contain quercetin and other flavonoids. According to Mount Sinai's page on supplements, if you exceed 1 gram per day, it can cause kidney and liver damage.

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A List of Supplements

Quercetin

You can just buy quercetin by itself. No need to get it from other supplements, if you want maximize efficiency.

Dose: 500-600 mg, 1 gram max per day

Brands: Life Extension, Solaray, BulkSupplements.com, Swanson.

Star Anise

Contains shikimic acid, the primary ingredient in Tamiflu. Works best when combined with quercetin. Also has broad antiviral properties.

Dose: 2.6 g x 2 per day

Brands: BulkSupplements.com

Echinacea and/or St. John's Wort

Both significantly reduce viral load of Covid and show other antiviral properties.

Dose: 900 mg x 1 per day St. John's Wort; 500-4,000 mg per day of echinacea (20 mg polyphenols)

Brands: Nutrients, Nutrilite Immunity, BulkSupplements.com for St. John's Wort; Vital Nutrients for echinacea

Elderberry

Shows broad antiviral properties. Can also potentially stimulate production of immune cells. Contains anthocyanin, the most active ingredient.

Dose: 45 mg of anthocyanin per day

Brands: New Chapter Elderberry Force (Other brands don't contain enough anthocyanin.)

Olive Leaf Extract (Oleuropein)

Broad antiviral and even antifungal activity. Blocks viral replication. Effective against Covid, flu, HIV.

Dose: 500-1,000 mg per day (80-90 percent pure)

Brands: Swanson, Solaray, GNC, Nature's Way. (250 mg capsules contain about 100 mg actual oleuropein.)

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More Supplements

Oregano

Very broad antiviral activity, including equine influenza virus, flu, Covid, HIV. Contains carvacrol, most active ingredient.

Dose: 600 mg per day (2-3 weeks max)

Brands: No specific brand.

Cinnamon

Also effective against viruses.

Dose: 2 tablespoons of Ceylon cinnamon or safe Cassia extract.

Brands: Swanson, Nature's Bounty, Puritan's Pride

Garlic

Contains allicin, a compound with strong antiviral properties. Has shown to fight viral persistence.

Dose: 600 mg for 150 days, 300 mg for another 150 days

Brands: Nature's Way, Life Extension, Garlique

Kudzu Root & Radix Bupleuri

Broad antivirals that reportedly work well with other meds to fight HIV infections and other illnesses. Both contain quercetin, so be careful with other supplements. Also contain puerarin and kaempferol, strong antivirals.

Dose: 200-400 mg per day of puerarin, 3-10 grams of Radix Bupleuri.

Brands: No specific brand.

Other Supplements

Artemesia Annua, black cumin seeds, and dandelion extract have also shown strong potential for fighting infections, but it's hard to find standard dosage information.

On top of these supplements, stay hydrated and take plenty of vitamins, especially B, C, and D+K2.

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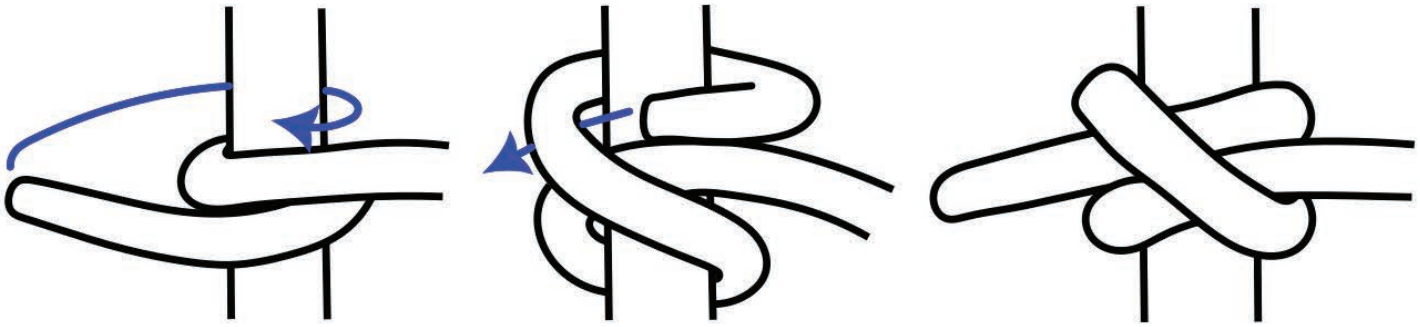
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Knots: From the Knot Repository

It's worth knowing how to die a few good knots. Some of the most experienced survivalists and preppers know hundreds of knots. Entire books on knots exist. You don't need to know them all. If you were only going to learn a handful of knots, learn these.

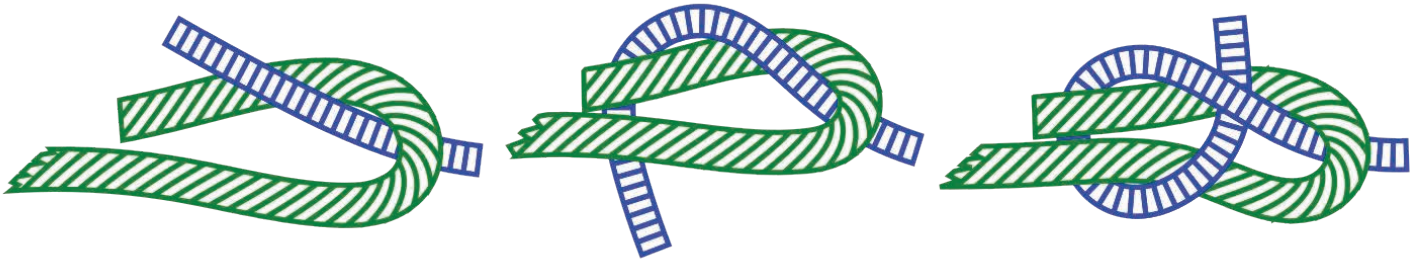
Clove hitch

Used to quickly bind a rope to a post, spar, or tree trunk. It works best as a temporary starter knot or when there is constant, equal tension on both ends, as it can slip if the rope goes slack or rotates.



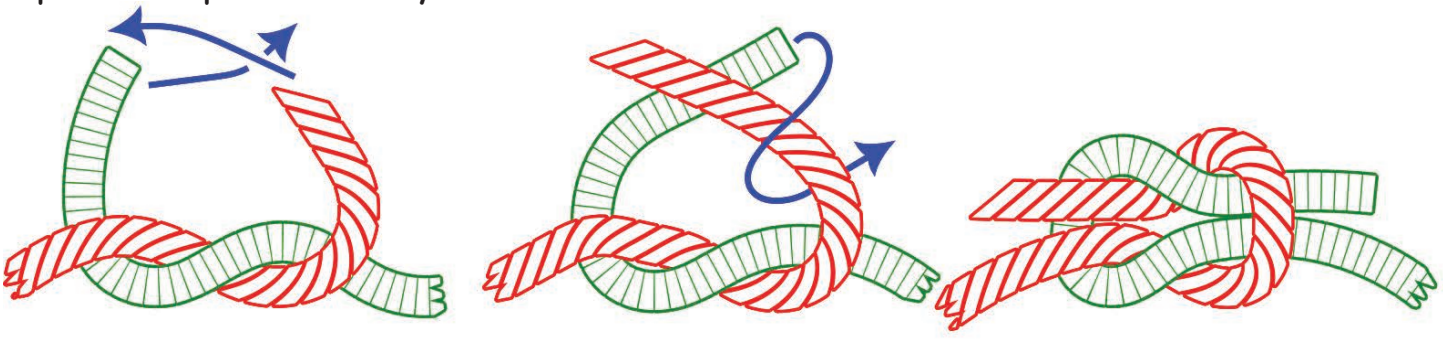
Sheet bend

Used to join two ropes of different diameters together. The thicker rope forms a simple bight while the thinner rope wraps around it, tightening securely under load without jamming.



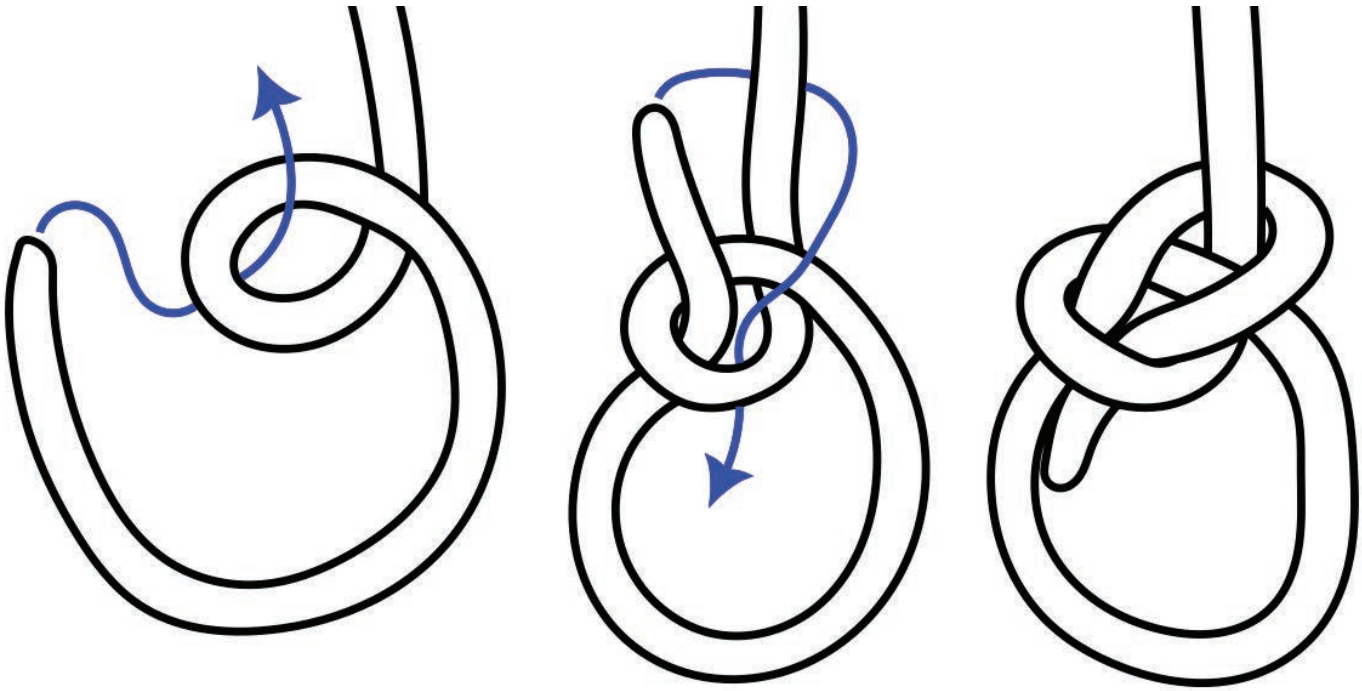
Square knot

Used to tie the two ends of a single rope together around an object, such as securing a bundle, parcel, or bandage. It should never be used to join two separate load-bearing ropes, as it can capsize and spill under heavy tension.



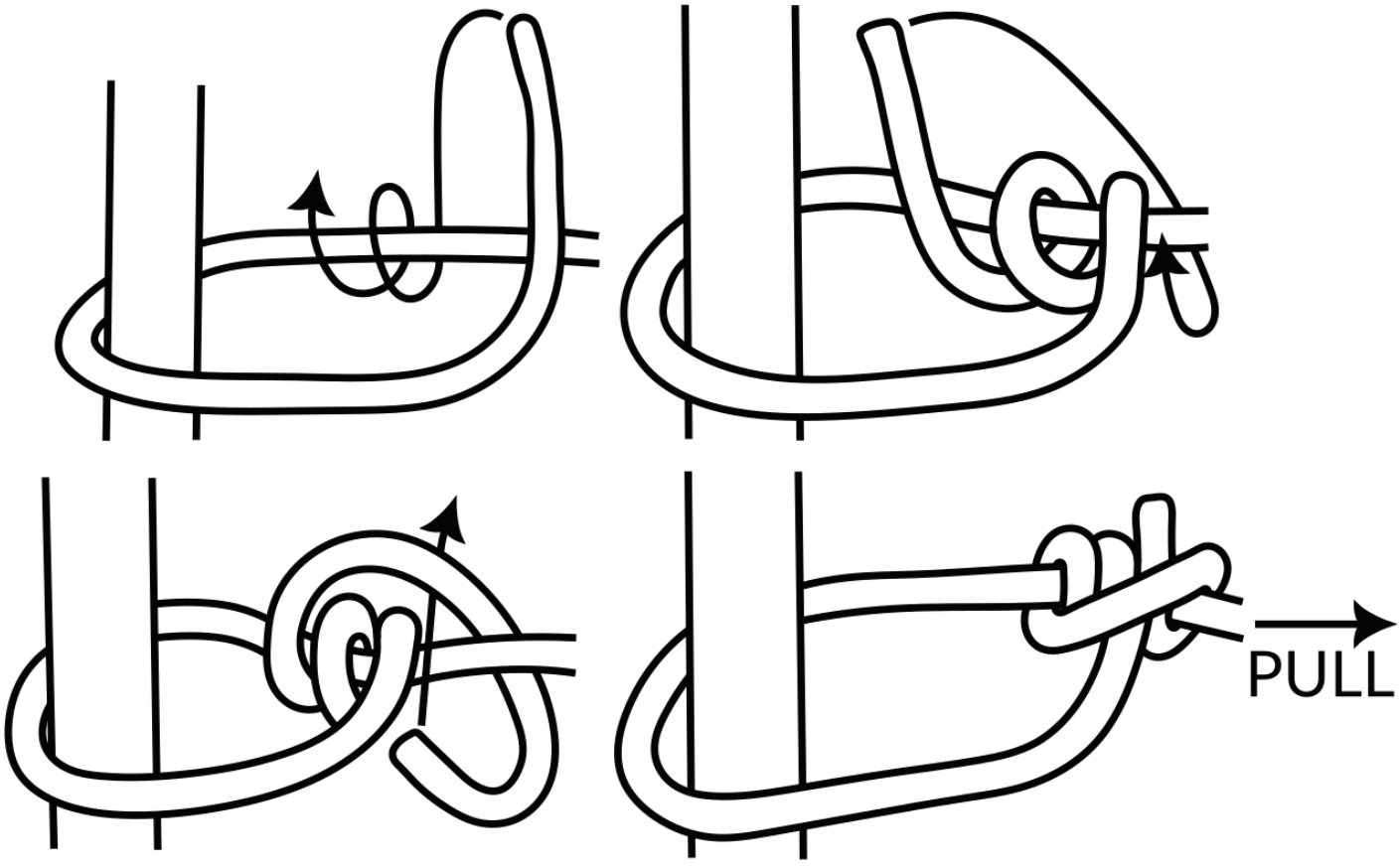
Bowline

Used to create a secure, non-slip fixed loop at the end of a rope. It holds firmly under heavy loads without jamming, making it easy to untie once tension is released.



Tautline hitch

Used to create an adjustable friction loop that slides up and down the standing line to tighten or loosen slack. For securing tent lines, tarps, and cargo tie-downs.



Mental Health



Mental health matters just as much as physical health during an emergency, especially when the emergency lasts for weeks or months. It's not a mushy topic. There are practical things you can do to maximize and protect that health. We're going to start with some basics.

*Schedule news windows. You don't need to scroll your phone constantly.

*Some people like watching disaster reels and communicating with all their online friends during times of crisis. Posting makes them feel connected. If it genuinely makes you feel better, then do it. Only you know what you need during these times.

*Try to establish some kind of routine. Sometimes, tedious activity is just what you need. (Only you know...)

*Take a nap if you're not facing immediate danger. It resets your brain.

*Play games. Board games. Whatever kind of games. Keep some around. It sounds silly, but it also helps refresh your brain and clean out stress hormones so you can think.

*Go easy on yourself. Now is not the time to worry about work, school, bills, or anything on that front. It can wait.

*Talk, but also respect someone else's need for quiet. And vice versa. If you really need to talk, or you really need down time and quiet, frame that need for friends or family so they know what's going on.

*You can be very honest about how you're feeling while also being concise. Take time to gather your thoughts.

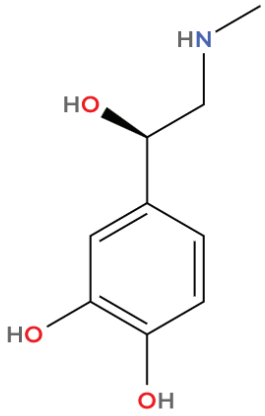
* Check in with friends and family. Focusing on other people can actually help keep your mind off volatile feelings until you have the time and space to unpack them.

A Few Important Brain Chemicals

When you know what's happening inside your brain during a disaster or an emergency, that gives you much more power over your emotions and your response.

Adrenaline/Epinephrine

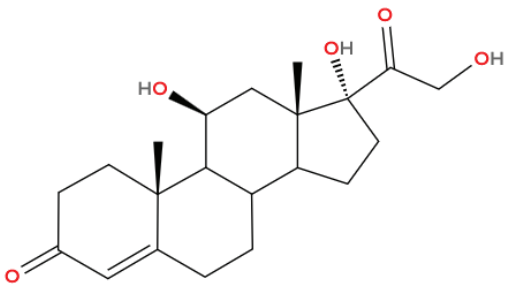
What your brain produces when it needs to respond to a threat. Fight or flight.



When you start to panic, that's often triggered by a rush of adrenaline. The same thing happens when you start to get angry and aggressive toward someone or something. Your brain also produces it in response to pain.

Cortisol

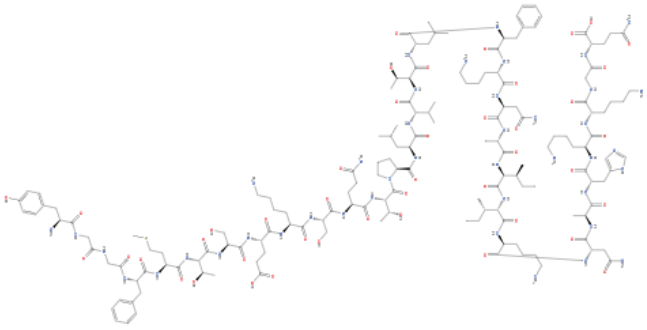
What your brain produces under prolonged stress to keep you going. Keeps you alert.



When you feel that drive to keep going, that's cortisol. Even when you're not having an emergency, it works alongside dopamine to push you through crunch times, like when you're wrapping up a big project or preparing for a job interview, etc.

Endorphins

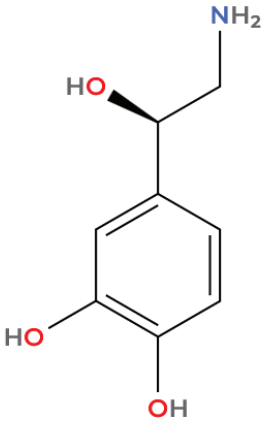
What your brain produces in response to pain, exertion, or intense stress. Painkiller.



Consider endorphins the elite special forces of your brain chemistry. They reduce or block pain. When the mom lifted that Chevy Impala in 1982 to save her son, adrenaline provided the strength. Endorphins blocked the pain.

Norepinephrine

What your brain produces on top of cortisol for extra boosts of sharp thinking. It's focus.

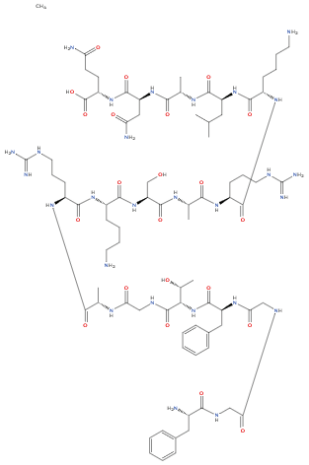


When someone takes decisive action during a disaster, that's the norepinephrine doing its job. Think about situations like defusing a bomb or fixing a flat tire. It's this chemical that helps you complete complex tasks.

A Few Important Brain Chemicals

Nociceptin

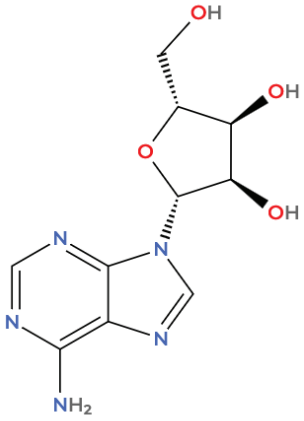
What your brain produces when it's experiencing too much stress or pain.



Knowing when to back off, take a break, or give up isn't pessimistic. It can save your life. This chemical tells you when to take a few minutes and rest or reassess.

Adenosine

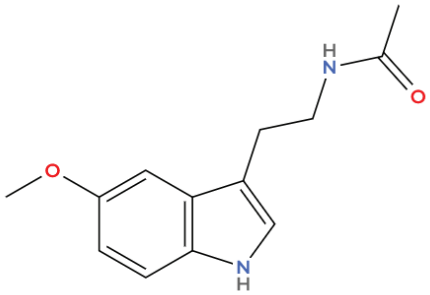
What your brain produces when it's ready to get some rest and needs you to know.



It would be deadly if you simply fell asleep right in the middle of doing something. Adenosine is what tells you to shut down, so you can get into a safe place and position.

Melatonin

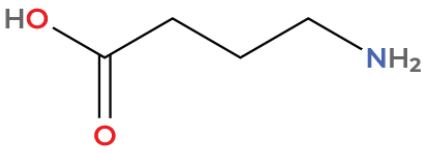
What your brain produces in response to darkness, to wind you down.



Yes, you can tell it's dark outside without chemicals in your brain. But the chemicals help you stay on a sleep schedule. Even if you're a night owl, that's just melatonin working in a different way for you.

GABA

What your brain produces when it's not ready for sleep but wants to relax.

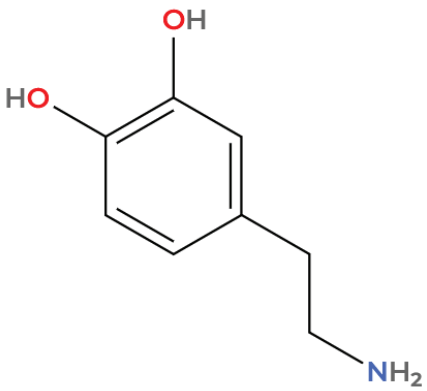


Your brain and body need time to rest that's not necessarily sleep. The whole point of being human is to enjoy life, not simply eating, sleeping, and fighting threats. This is one of the chemicals that makes life worth living.

A Few Important Brain Chemicals

Dopamine

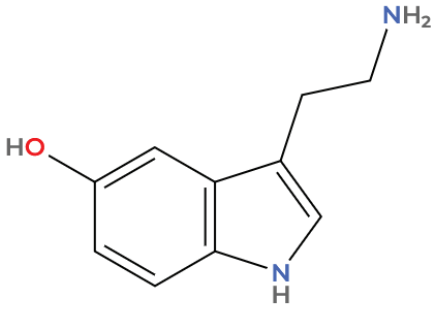
What your brain produces when it's expecting a reward. Regulates goal seeking.



Most people think dopamine is the reward. They're wrong. Dopamine is what fuels motivation, hope, and drive. You need just enough to keep you going. Too much becomes hopium.

Serotonin

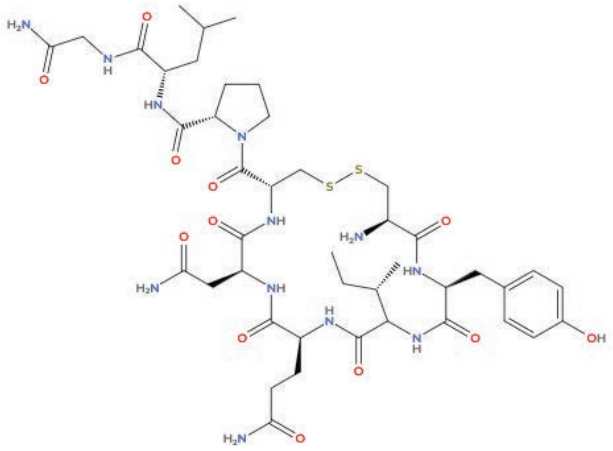
What your brain produces when it feels safe and calm. Provides stability.



Once you reach safety, it takes a while for your brain and body to acclimate. You might still feel really worked up. Give it a day or two, as the serotonin comes in.

Oxytocin

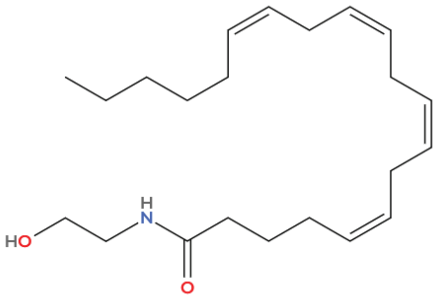
What your brain produces when it's engaged in bonding and teamwork.



It's easy to feel like you can take on the end of the world by yourself. Oxytocin is what reminds you that it can feel good to work together and comfort each other.

Anandamide

What your brain produces when it's experiencing bliss or euphoria.



A lot of people spend their entire lives chasing feelings of bliss, and their desire for joy can override their practical thinking. Remember, you're not designed to bliss out all the time. These are rare for a reason.

Practical Strategies for The Long Haul

Your brain can't stay in a constant state of vigilance and threat response, but it will continue to produce stress chemicals even after threats and danger have passed. Regulating your emotions isn't about pretending everything is normal or ignoring danger. It's about resting your mind so you can continue to function over days, weeks, and months during a prolonged crisis.

1. Micro-Chunking: Break bigger goals down into smaller tasks you or your group can complete. Plan out your day. Plan out your afternoon. Plan out the next hour. This sounds easy now. When you're stressed by a disaster, this note helps you remember. "I need to survive" turns into "Do we have enough water? How do we get some now?"

2. Anchor roles: People often find the capacity for courage or resilience when they need to care for someone else. They rise to the role. Caring for someone alters your brain chemistry and suppresses fear responses. So think about who you're surviving for.

3. Insight Meditation: Other forms of meditation focus on emptying your mind. Here, you focus on your emotions and let yourself feel them. If you have access to music, play some chants (Gregorian, Tibetan, etc).

4. Affect Matching: Dark art and music can help you process negative emotions by complementing your current mood.

5. Grounding/Mindfulness: Focus on physical sensations and observations, not thoughts swirling through your head.

6. Sensory Deprivation: Remove sensory stimuli by wearing a sleep mask, listening to white noise or chants, and sitting in a dark place. Use blackout curtains if you can. This lowers stress hormones, and it can be especially helpful for neurodiverse minds.

7. Memory: Remember a pleasant or vivid time from your past. You can write about it, or just sit and think about it.

8. Movement: Organizing a pantry or a bag. Check supplies. Go for a short walk or patrol. Short periods of activity (10-15 minutes, 30 minutes, etc) help your body process stress hormones and refocus your attention.

9. Journaling: This doesn't have to mean detailed diary entries. You can just make a to-do list or a list of things that are bothering you. Writing it down helps make it tangible and manageable. It can turn a vague sense of dread into a discrete set of problems to solve.

10. Deep breathing and sighing, slow breaths for several seconds inhale and exhale. It slows down your heart rate and stimulates your Vagus Nerve, calming you down and clearing out compounds like cortisol.

11. Unfocused gazing. Just stare off into the distance, letting peripheral vision take over. Unfocused attention helps lower adrenaline and other stress hormones.

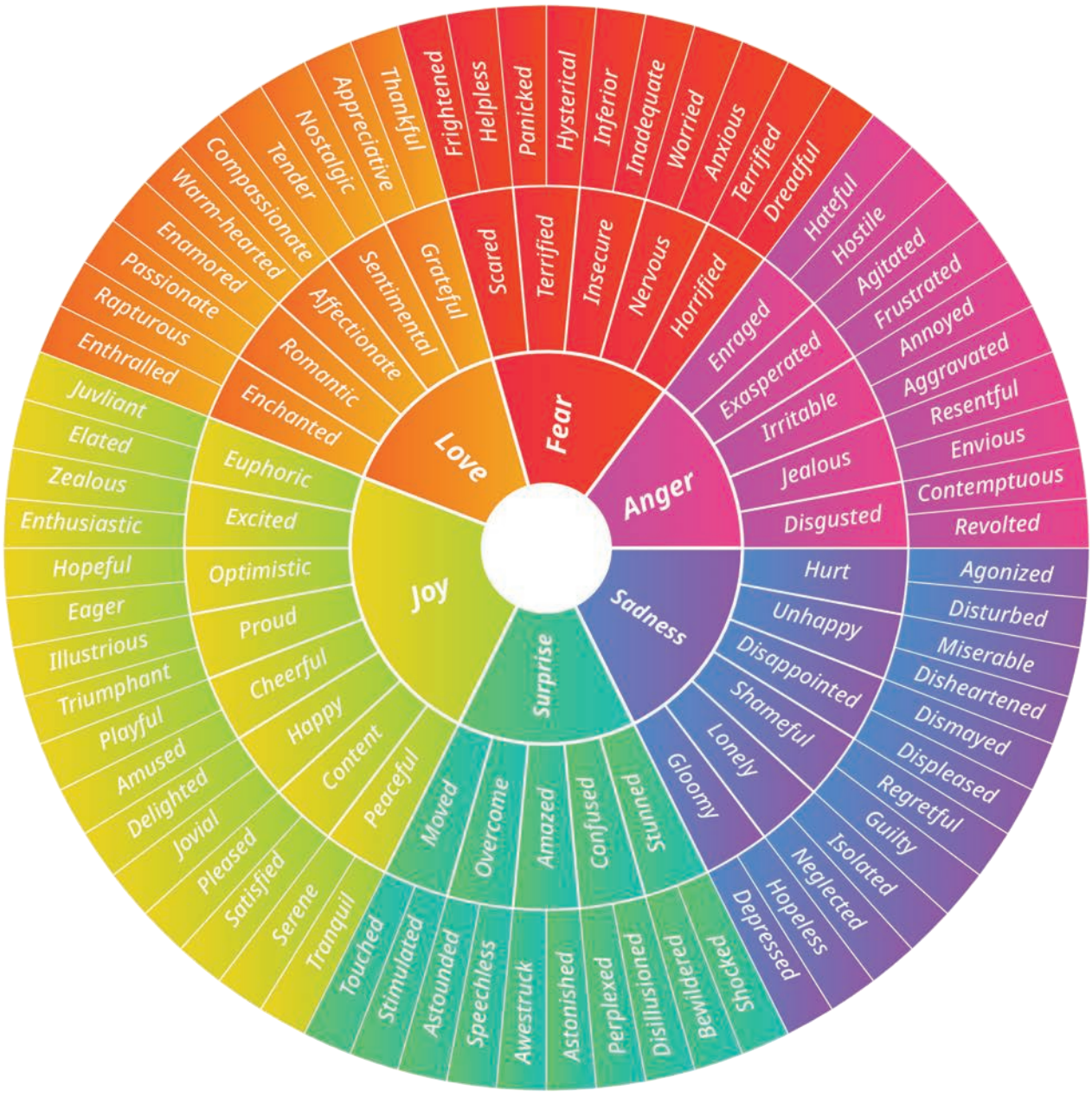
12. Splash cold water on your face for 30 seconds. It also lowers your heart rate and induces lower metabolism.

Radical Acceptance

When the situation feels overwhelming, many philosophies recommend acceptance as a powerful way to reset. You don't need all the reasons or all the answers at any given moment. You can plan and problem solve later. For now, you reset by letting go and releasing your need to control a situation. You might even accept a worst-case outcome, including mortality. Ironically, these moments relax your brain and let you see solutions that were right in front of you.

Naming What You Feel = Control

Emotions Wheel



You don't always need to name your emotions, but it often helps. Studies have shown that identifying your emotions immediately lowers symptoms of stress. During a disaster, you're going to feel a lot of emotions.

You're going to feel some of them all at once, at the same time. Even during calm times, some of us aren't in touch with our emotions. We think we're fine when we're not. One emotion hides under another. Just seeing all of the emotions in one place helps.

The 7 Types of Rest



Physical Rest

Muscles and nervous system. It's mostly physical.

Mental Rest

Consider this "relaxing," time you're not actively focusing on a problem.

Sensory Rest

Drawing the curtains. Putting on the sleep mask. Listening to some white noise.

Creative Rest

Similar to relaxing, but it involves more mindfulness, walking in nature, etc.

Emotional Rest

You stop performing the emotions you need to get through the day. "Be yourself."

Social Rest

Could be time alone, or with a small group. You're not performing for anyone.

Spiritual Rest

Rituals. Prayers. Reconnecting the values, purpose, etc.

The future is going to be full of challenges, disasters, and crises. Some will last a few days, others will last a few months. A few might even last years. You won't be sprinting through these situations.

A lot of us think the only rest we need is physical or mental. But to take care of yourself and your family or group, you need to get all the other forms of rest.

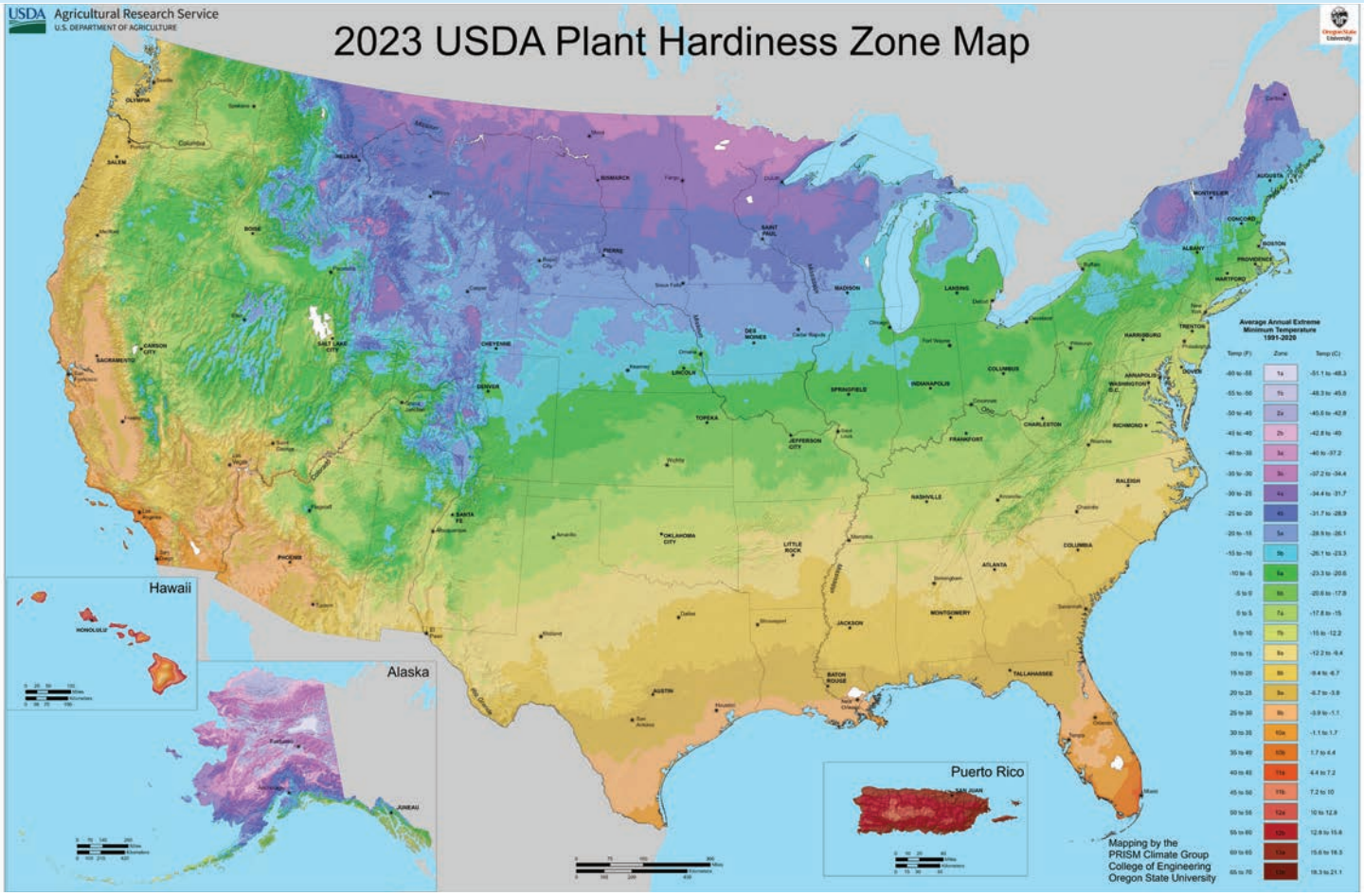
That's how you survive.

How to Grow Food

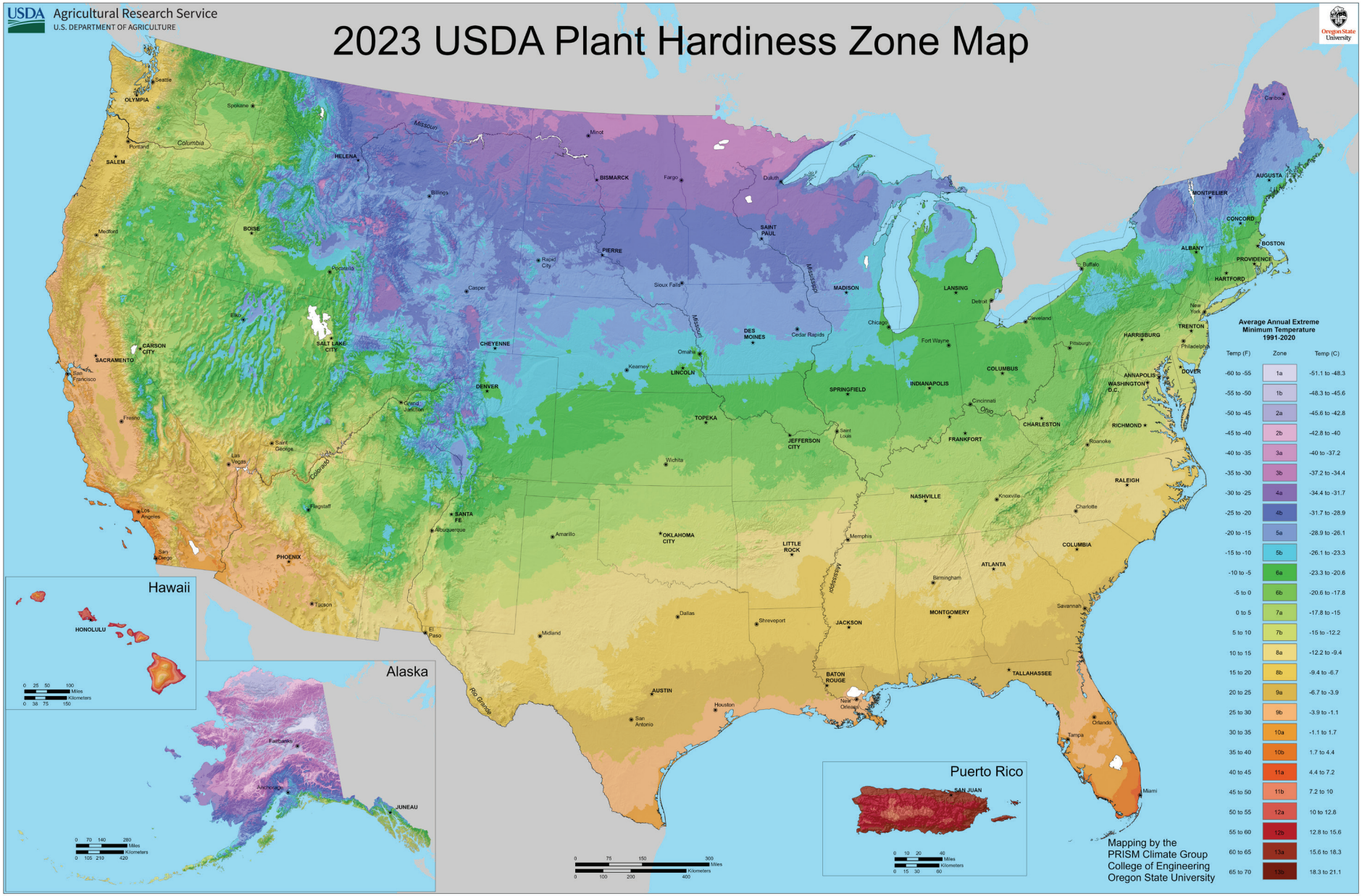
This chapter covers the basics of gardening. We're going to talk about hardiness zones, planting, and watering. You'll also find a list of common fruits and vegetables with vital information about ideal growing conditions, pollination, and pests.



Understanding Hardiness Zones



The first step is figuring out what to grow where. A hardiness zone map illustrates temperature ranges, so you have a basic idea of what plants would survive through winter. From there, you can start to gather other important information about first and last frost dates, annual and monthly precipitation, and humidity. Hardiness zones especially matter for anyone who wants to grow food during the winter. With the right equipment (like greenhouses, tunnels, row covers, outdoor blankets, etc.) it's possible. As the years go by, the hardiness zones will shift a lot. It's a good idea to start practicing and stretching your skills, growing fruits and vegetables in more extreme conditions and learning how to protect them. Start thinking about what crops you'll be growing 5-10 years from now, and what you'll need to do that.


USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE
2023 USDA Plant Hardiness Zone Map
Oregon State University
Average Annual Extreme Minimum Temperature 1991-2020
Temp (F) Zone Temp (C)
-60 to -55 1a -51.1 to -48.3
-55 to -50 1b -48.3 to -45.6
-50 to -45 2a -45.6 to -42.8
-45 to -40 2b -42.8 to -40
-40 to -35 3a -40 to -37.2
-35 to -30 3b -37.2 to -34.4
-30 to -25 4a -34.4 to -31.7
-25 to -20 4b -31.7 to -28.9
-20 to -15 5a -28.9 to -26.1
-15 to -10 5b -26.1 to -23.3
-10 to -5 6a -23.3 to -20.6
-5 to 0 6b -20.6 to -17.8
0 to 5 7a -17.8 to -15
5 to 10 7b -15 to -12.2
10 to 15 8a -12.2 to -9.4
15 to 20 8b -9.4 to -6.7
20 to 25 9a -6.7 to -3.9
25 to 30 9b -3.9 to -1.1
30 to 35 10a -1.1 to 1.7
35 to 40 10b 1.7 to 4.4
40 to 45 11a 4.4 to 7.2
45 to 50 11b 7.2 to 10
50 to 55 12a 10 to 12.8
55 to 60 12b 12.8 to 15.6
60 to 65 13a 15.6 to 18.3
65 to 70 13b 18.3 to 21.1
Hawaii
Alaska
Puerto Rico
Mapping by the
PRISM Climate Group
College of Engineering
Oregon State University

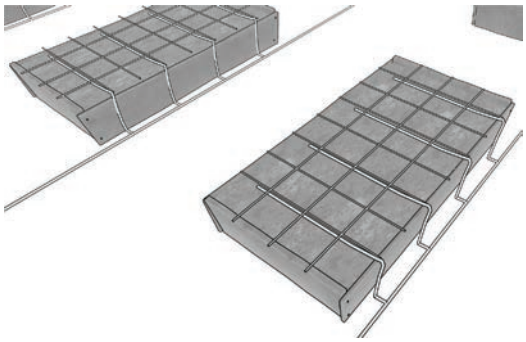
How to Prepare The Soil

Next, you'll want to study your soil. You can pick up a simple soil test kit from a number of different hardware and gardening stores. You'll learn your soil's pH levels, as well as the levels of key nutrients like nitrogen, phosphorous, and potassium. The better these levels, the healthier your plants.





Most suburban yards have poor soil. They're built on fill dirt that has very little in terms of nutrients. Years of overlandscaping and pesticides have probably made things worse. Fortunately, you can fix that by adding soil and compost. You can have it delivered from local companies. You can probably even hire someone to move it for you. Start your own compost heap and grow your garden, and you'll eventually restore the soil.



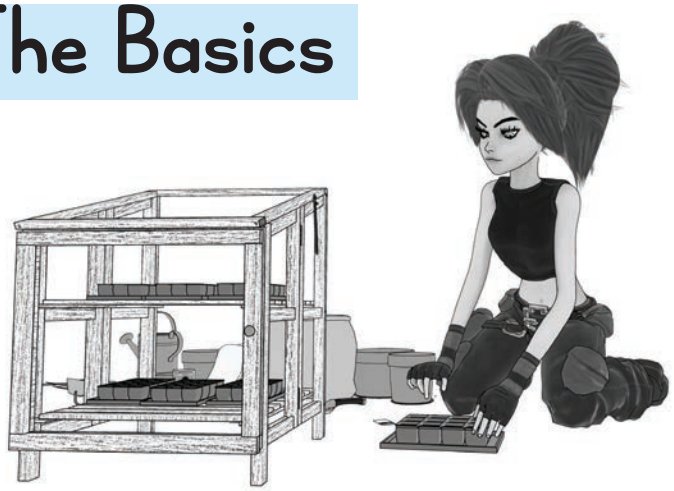
Raised bed gardening makes the most sense for urban and suburban farming. Many beds run 2x6 ft or 4x8 feet. Use square foot gardening when planning your beds. It makes everything else easier. Most plants need 1 or 2 square feet to thrive. You can plant 3-4 smaller crops in one square.



Fill the bottom with soil and dirt. Save your compost for the top six inches. Mix it with soil. You can also just scoop compost into the holes for your plants, if you don't have much. Once you've planted, you can add mulch to help conserve moisture and keep your compost from washing away.

How to Plant Seeds: The Basics

Most urban and suburban gardeners will want to start seedlings indoors 4-6 weeks before the last frost. Depending on your hardiness zone, the last frost could happen anywhere from March through April. Starting early means you get the most out of your peak growing season. Keeping seedlings indoors protects them from the elements, and from critters.





You can start seedlings in several different types of containers, even egg cartons. Some kits come with pre-filled soil trays or peat pots. You plant most seeds simply by poking a hole in the soil with a finger or a chopstick, about 1/4-1/2 inch. (Wash your hands first.) Cover and pat the soil firm so the seed has good contact. Give them all a good water. One seed goes in each hole if you don't want to thin them out later. Some seeds won't germinate, so anticipate that by planting more.

Baby plants need warm temperatures, plenty of water, and plenty of sun. Keep the soil moist, but not soggy. Give them as much as 12-16 hours of light a day. It helps if you have a cold frame to maximize their exposure to the sun while keeping them warm. If you can't do that, grow lights and grow bulbs do the job.







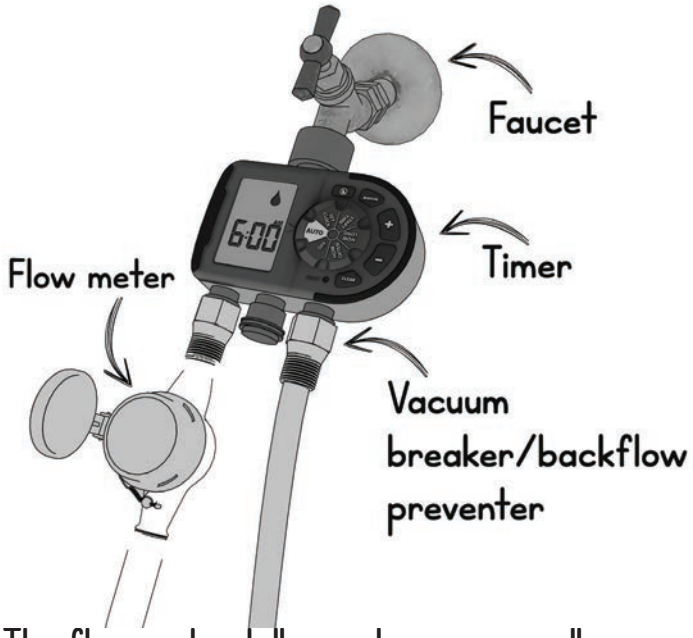
Pat the soil down around the roots. Give them one more water.



Around 4 weeks, plants are often ready to transfer outside. They should have 1-2 sets of adult leaves. Harden them off for a week. Right before transplanting, water the plant and the new soil. Hold them by root soil and leaves, not the stem.

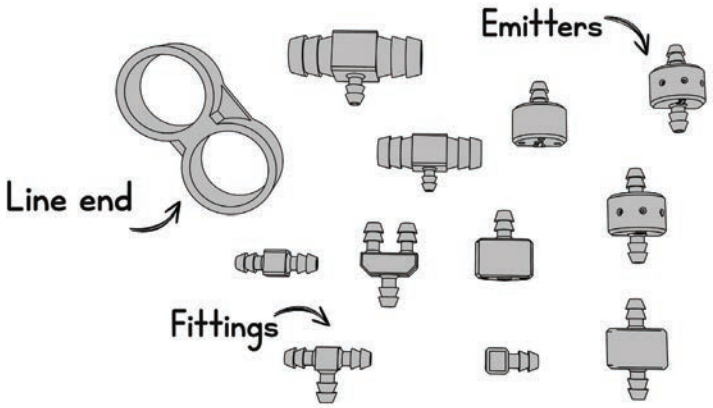
Drip Irrigation: The Basics

While your seeds take hold, you might want to rig up a drip irrigation system. They save a lot of water, and they can also make your life a lot easier. It looks complicated at first, but the parts make sense.



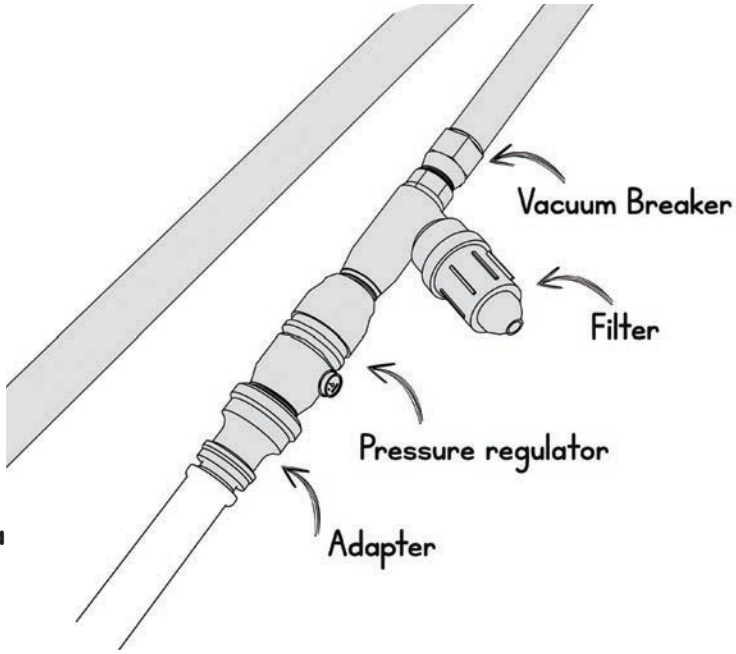
The flow meter tells you how many gallons per minute or hour are coming out of your faucet. You'll need this figure for some important calculations that help you decide on the size of your system and whether you'll need more pressure.

You'll need tubing and emitters. You'll need a vacuum breaker, also known as a backflow preventer. You'll need a filter and a pressure regulator and a flow meter. You'll also want a hose timer. Some come with up to five hose splitters, so you can set up different schedules for different beds or "zones" of your garden.



Fittings and drip emitters come in different sizes, from 1/2 GPH to 2 GPH. You'll probably want 1/2 gallon emitters. You can buy some drip irrigation tubing with emitters pre-installed.

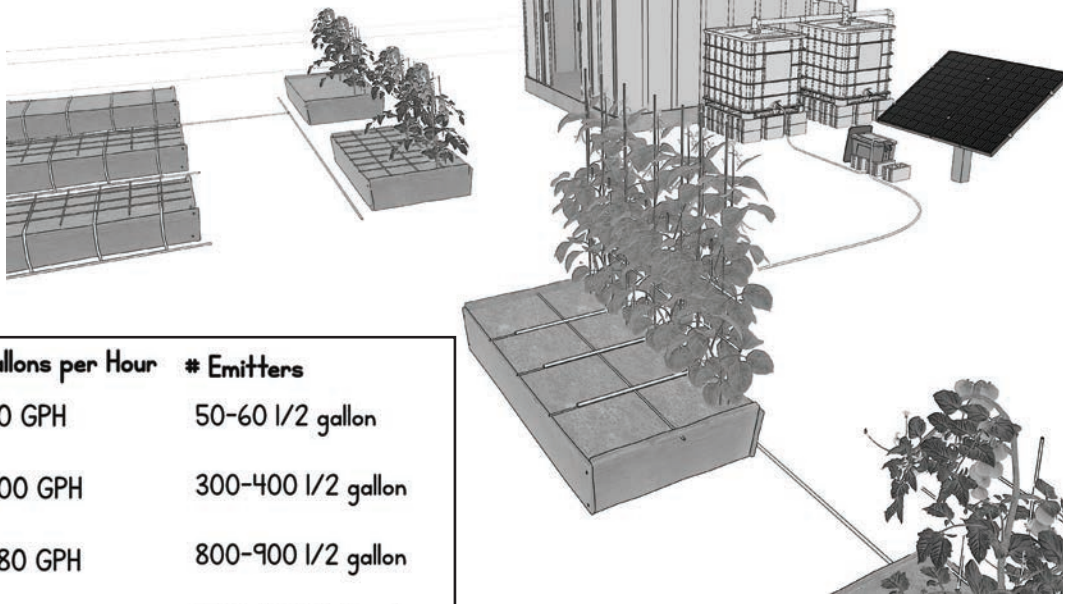
Gardeners offer different approaches to the rest of the setup. Many also strongly recommend you install a vacuum breaker closer to the junction where hose meets irrigation line. Then you'll need to install a filter and a pressure regulator. The filter keeps water going to the plants extra clean. The pressure regulator ensures 10 PSI is going to the drip lines. You don't want it any stronger. Finally, you'll need a hose to drip irrigation adapter.



Drip Irrigation: Continued

To figure out how long and how far to run your drip irrigation system, you'll need to calculate how much water you need. You can use the same basic formula we use for rain catchment. Multiply inches/centimeters of rain needed by the square footage of your crops, then multiply by .623, and that gives you gallons (liters) of water needed per week.

Drip irrigation hose comes in different diameters. Each diameter accommodates a different run length from your water source to the emitter line. Run length corresponds to gallons per hour. For main lines, use 3/4-1 inch. For the emitters, use 1/4 inch.



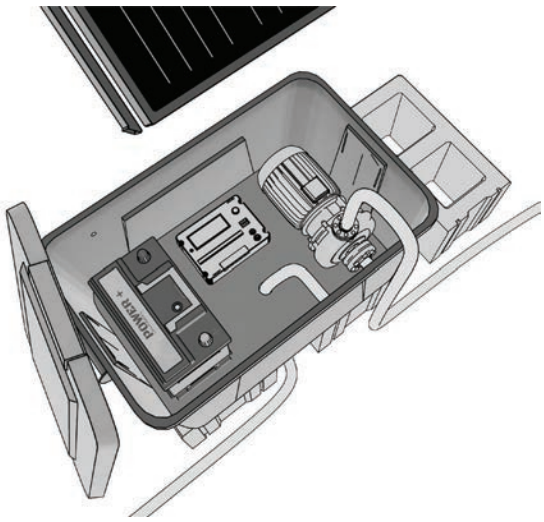
Tube Diameter	Run Length	Gallons per Hour	# Emitters
1/4 inch	30 Feet	30 GPH	50-60 1/2 gallon
1/2 inch	200 Feet	200 GPH	300-400 1/2 gallon
3/4 inch	480 Feet	480 GPH	800-900 1/2 gallon
1 inch	960 Feet	960 GPH	1,500-1,800 1/2 gallon

A standard outdoor faucet delivers about 5-6 gallons a minute at 40-50 PSI. That's about 300 gallons per hour. It can provide enough pressure for about 100 feet of hose. Drip irrigation systems significantly extend a hose's reach because they use less water pressure. The pressure regulator drops your hose from 40 PSI to 10.

Let's say you have 500 square feet of beds with plants that need 1 inch of water per week. That's about 311 gallons of water total.

If one plant takes up one square foot, and one emitter emits 1/2 gallon per hour, then the system should run a little more than 1 hour per week (1.25 hours). Divide that by 7, and you have your daily watering schedule. Run the drip irrigation for about 10-12 minutes a day. Watch your moisture levels and plant health. Adjust as needed. Every garden is different.

If your drip irrigation system can't get enough pressure, it's okay. You can make a booster with a simple transfer pump and a battery. You can even rig one up to run on solar energy. If that fails, you can install a manual pump. It's not ideal, but it works.



Trellising & Plant Support

Some of the plants you'll grow need support. They fall into two broad categories: natural climbers and assisted climbers. Natural climbers curl around or latch onto structures like a trellis and grow up it on their own. Some of them grip with tendrils. Others twine. Assisted climbers need your help. You'll need to weave the vines around the trellis as they go.

Natural Climbers

Pole beans: They grow in spirals until reaching a trellis or other support. Then they'll naturally curl up and around it.

Runner beans: Same as pole beans.

Peas: They develop tendrils that grip a support structure.

Cucumbers: Tendrils.

Melons: Tendrils

Assisted Climbers

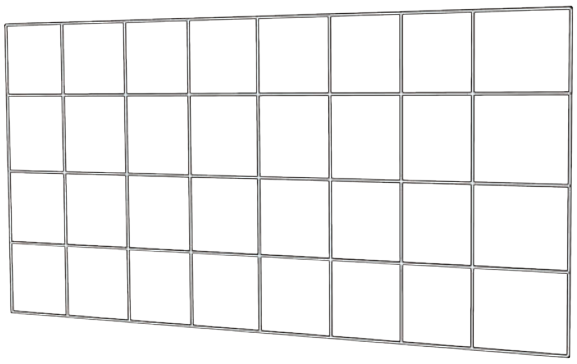
Tomatoes: You need to tie them to poles or tall stakes to keep them upright. Otherwise, they'll sag. You can also use tomato cages.

Winter Squash: These include butternut squash and acorn squash. The weight of the fruit weighs down the entire plant. You'll have to weave the vines through fence or trellis panels. Some gardeners even use slings to support the fruit/vegetable.

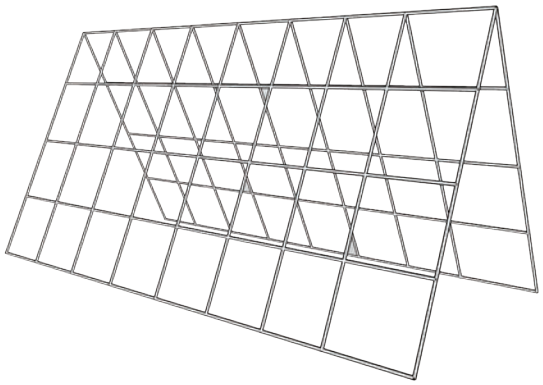
Pumpkins: Same as winter squash.

Types of Support

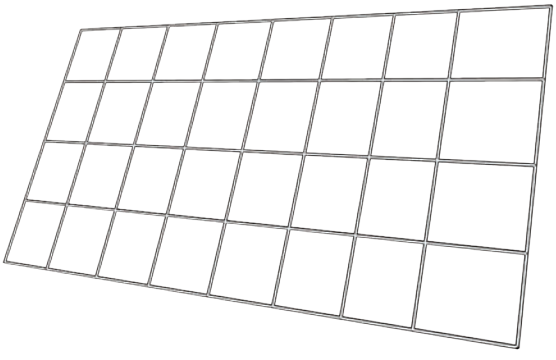
Cattle Panels/Hogwire



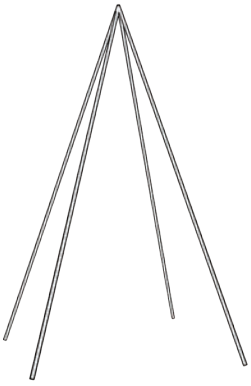
A-Frame Trellis



Lean-to Trellis



Tripod Trellis

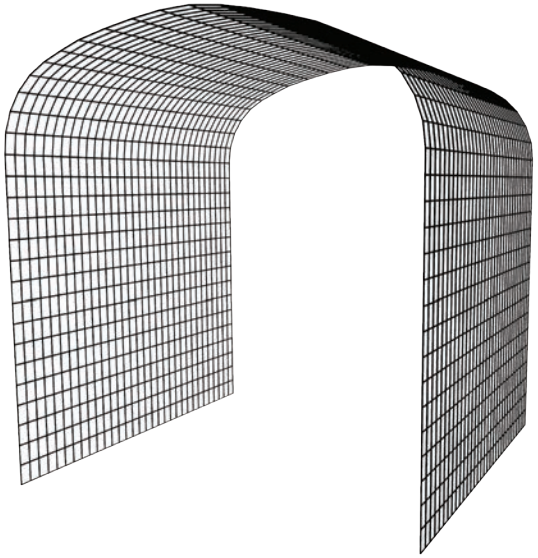


More Types of Support

Towers/Obelisks



Arch Trellises



Which Kind to Use

Stakes and t-posts: You can also create simple trellis structures with stakes or t-posts with twine or wire. This method works for zucchini and summer squash varieties, as well as some varieties of tomatoes. Any plant that grows tall and needs support can benefit from this straightforward support structure.

Regular cattle panels: These provide a lot of the same support as stakes and t-posts. They're just more cohesive and portable.

A-Frames: These work well for cucumbers, squash, and beans. They also create a shade where you can grow spinach, kale, etc.

Tripods: These work well for pole beans, runner beans, and other vining plants.

Arch Trellises: Best for winter squash, cucumbers, melons, and other heavier vining plants that need support. Any heavier plants you don't want lying on the ground, you can try to vine them on arch trellises.

There aren't any hard rules on which trellises work best, but knowing them up-front helps as you gain experience and experiment. You'll decide for yourself which plants you prefer to grow on which trellises.

Low Tunnels & Row Covers

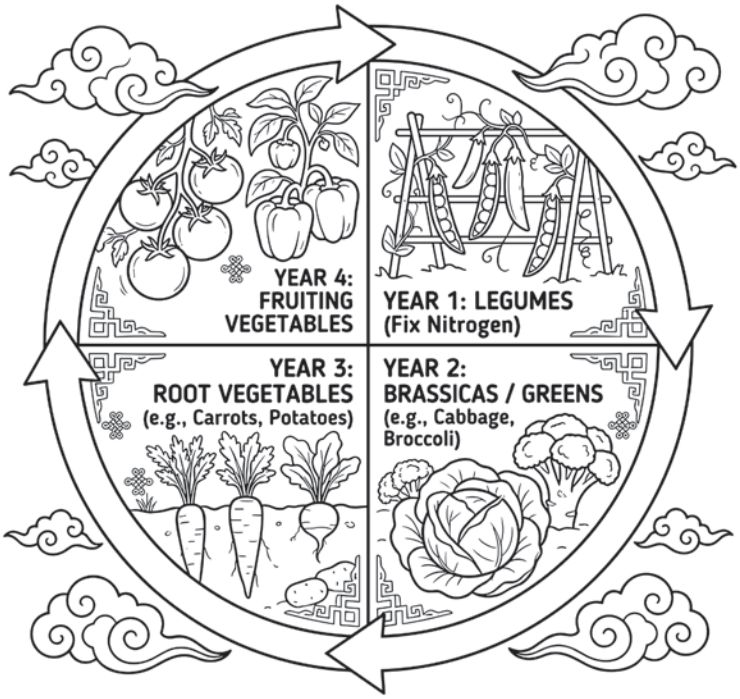
There's one other type of support we're grouping in here: low tunnels with row covers. You build the tunnels over your beds or rows. You cover them in plastic sheeting or fabric blankets. You hold the sheets down with landscape staples/ stakes.

These keep your plants warm on colder nights during the fall, winter, and early spring.

How do you make all of this stuff? You can use two simple building blocks: garden hoops and mesh. You can get them made from different materials. Gardening shops and hardware stores carry them on a regular basis throughout the year. You bend the garden hoops into archways and tunnels, then run mesh over them when you need.



Crop Rotations



You'll want to rotate the types of crops you're planting in each location every season to maintain the health of your soil. Gardeners follow a basic rotation cycle of four years. Plant legumes (beans, etc) the first year to fix nitrogen and other nutrients in the soil. Brassicas like broccoli and kale consume these nutrients. During year 3 or 4, plant fruiting vegetables (nightshades) like tomatoes. They're also heavy feeders. Before replanting legumes, grow root vegetables to help break up and clean the soil. Repeat. Key: Make sure you don't plant brassicas back to back. Same goes for nightshades. They'll deplete the soil.

Between seasons, you can plant cover crops like rye, clover, oats, and buckwheat. They grow fast, 4-6 weeks. Don't harvest cover crops. Chop them down. You can till them straight into the soil and then wait 2-3 weeks. Now, most gardeners leave them as mulch and plant without waiting. This way, you don't till and the soil absorbs the nutrients over time.

Companion Planting

We're going to cover every major crop in detail soon. First, it's important to understand the families of vegetables. It especially matters for planting diversity in your raised beds and other zones. You want to avoid monocultures because it's an invitation to pests and disease. You can generally plant one from each family in a bed, with some exceptions. (See next page.)



Brassicaceae

Profile: Cool season, cold tolerant, heavy nitrogen feeders, high in sulfur.

Cabbage, broccoli, kale, collard greens, mustard greens, turnips, radishes, Brussels sprouts, cauliflower, kohlrabi

Apiaceae/Umbelliferae

Profile: Cool season, cold tolerant, breakup soil, attract beneficial insects.

Carrots, parsnips, celery, parsley, cilantro, dill, fennel, cumin.

Nightshades

Profile: Warm season, heat lovers, not cold tolerant.

Tomatoes, potatoes, bell peppers, hot peppers, eggplants, tomatillos, ground cherries

Fabaceae/Legumes

Profile: Drought tolerant, fix nitrogen in the soil.

Bush beans, pole beans, green peas, snow peas, fava beans, lentils, chickpeas, peanuts

Amaryllidaceae/Alliaceae

Profile: Cool weather, natural pest repellents and soil cleaners.

Onions, garlic, leeks, shallots, chives, scallions

Cucurbitaceae

Profile: Warm season, sprawling vines.

Cucumbers, zucchini, summer squash, winter squash, watermelons, cantaloupes

Amaranthaceae

Profile: Cool season, but amaranth grain is drought and heat tolerant.

Spinach, beets, Swiss chard, amaranth grain, quinoa

Asteraceae/Compositae

Profile: Low-maintenance crops that produce fast without depleting soil.

Head lettuce, leaf lettuce, artichokes, endive, radicchio, sunflower, Jerusalem artichokes

Poaceae

Profile: Cool season, heavy nitrogen feeders.

Corn, wheat, oats, rye, barley, rice, sorghum

Don't Plant These Together:

Generally, it's good for soil to mix families in the same bed.

However, some crops don't mix.

Brassicas

Brassicas are very heavy feeds. They don't mix very well in the same bed, unless you plant smaller ones like turnips or radishes. Plant brassicas with onions, spinach, carrots, and members of those families. Don't plant brassicas with nightshades. They're both very heavy feeders and they'll try to outcompete each other.

Fabaceae/Legumes

Don't plant beans with onions. The antimicrobial properties of the onions will interfere with the ability of bean plants to fix nitrogen and stunt them.

Nightshades

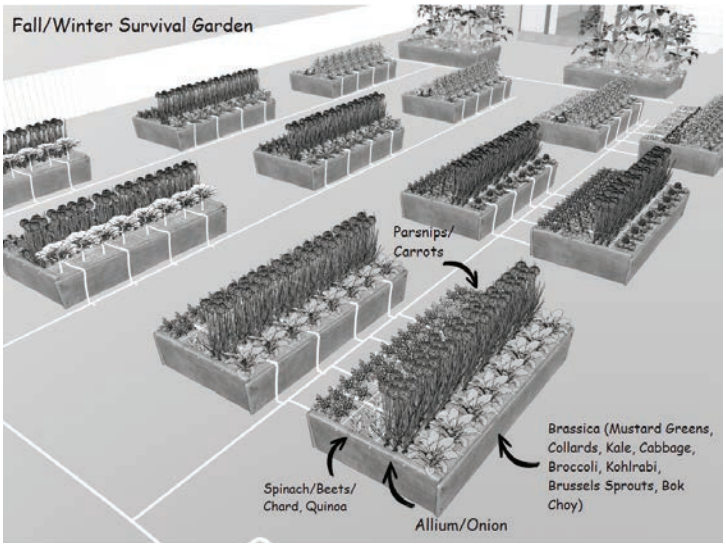
Don't plant tomatoes with brassicas or squashes. These three are all heavy feeders. You can plant them with light feeders or nitrogen fixers like beans.

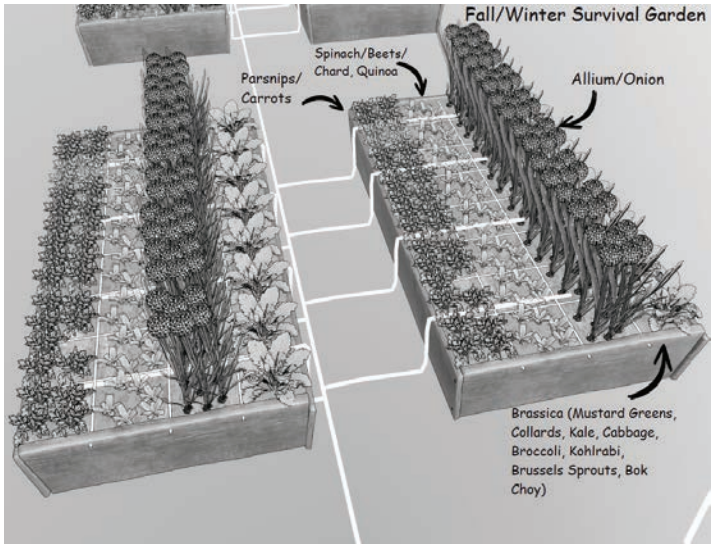
Potatoes

You're best off growing potatoes in a bucket on their own. They don't make great neighbors with other plants, and they're a pain to dig up. The bucket method allows you to just dump them out at harvest time.

Amaranth/Sorghum

Tall canopy plants like amaranth and sorghum can overshade plants that grow low and need light. However, you can mitigate that with a north-south layout. The sun crosses parallel, never creating intense shadows.





Winter Survival Crops

You can harvest these crops throughout the winter as long as you plant them by early September at the latest, depending on your zone. Wherever you live, you want about 70-80 days of reasonably warm weather and long sunlight. Once they mature, they'll tolerate the cold.

Kale

Tolerates temperatures down to 0F (-18C).

Collard Greens

Tolerates temperatures down to 5F (-15C).

Brussels Sprouts

Tolerates temperatures down to 15F (-9C).

Cabbage

Tolerates temperatures down to 15F (-9C).

Broccoli

Tolerates temperatures down to 20F (-7C).

Bok Choy

Tolerates temperatures down to 20F (-7C).

Turnips

Tolerates temperatures down to 15F (-9C).

Daikon Radishes

Tolerates temperatures down to 20F (-7C).

Rutabagas

Tolerates temperatures down to 15F (-9C).

Onions

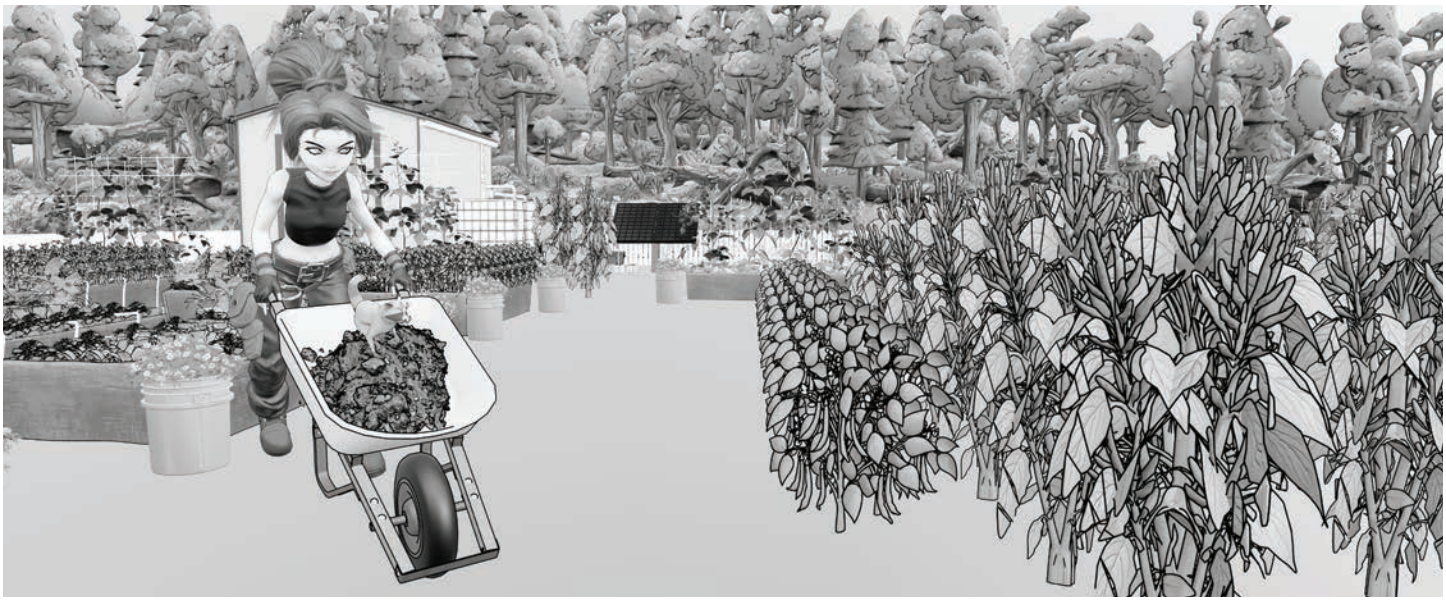
Tolerates temperatures down to 20F (-7C).

Scallions

Tolerates temperatures down to 15F (-9C).

Parsnips

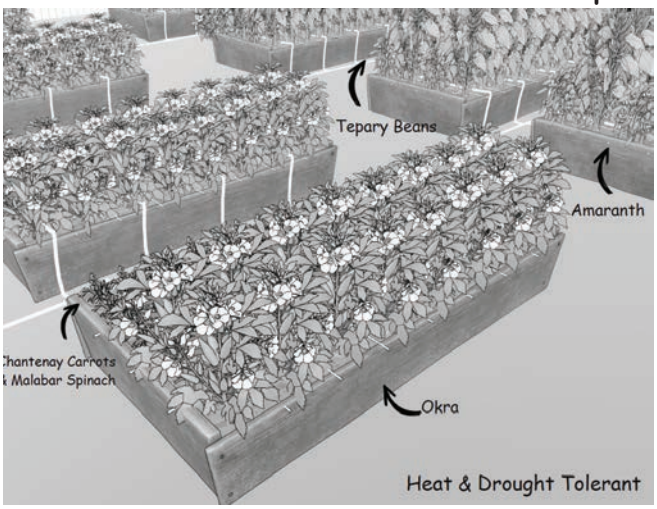
Tolerates temperatures down to 0F (-18C).



Your Drought, Heat Tolerant Dream Team

You can plant these crops in raised beds or you can plant them in the ground in a different zone. They're very hardy. They'll handle temperature extremes and dry spells.

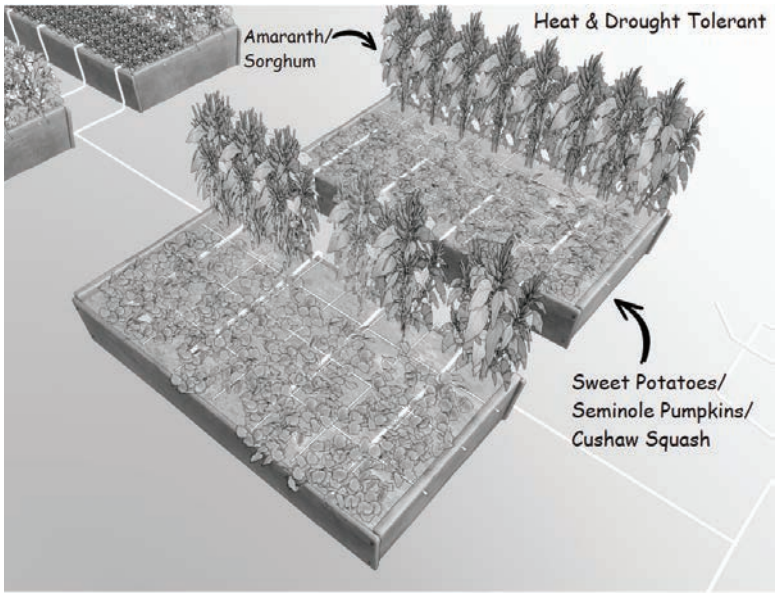
Tepary Beans
Callaloo Amaranth
Sorghum
Seminole Pumpkin
Okra
Chantenay Carrots
Wild Tomatillos
Malabar Spinach
Sweet Potatoes
Collard Greens (Georgia Southern)
Hot Peppers
Cowpeas
Black-Eyed Peas
Purple Hull Peas
Yardlong Beans
Fennel
Seminole Carrots
Bunching Onions
Scallions



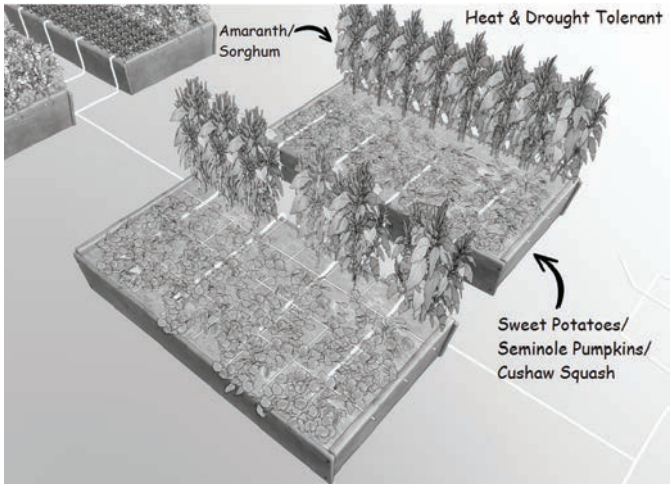
These plants can easily handle temperatures in the 90s and little water. Tepary beans can handle temperatures above 100F (38C), and they only need watering once every 10-14 days. The same goes for yardlong beans, cowpeas, black-eyed peas, and purple hull peas. Amaranth and Sorghum can handle high temperatures well and only need .5-1 inch of water once per week. Other plants like okra, chantenay carrots, and wild tomatillos need 1-1.5 inches of water once per week.

Tepary beans, malabar spinach, callaloo amaranth, okra, and sweet potatoes will all keep producing even when temperatures run above 100F (38C). The rest will survive and pause growth until it cools back down.

By comparison, ordinary plants need at least 2 inches of water a week during heatwaves. They'll struggle in heat waves, and they'll die quickly without water. Sometimes, it only takes one hot afternoon without water.

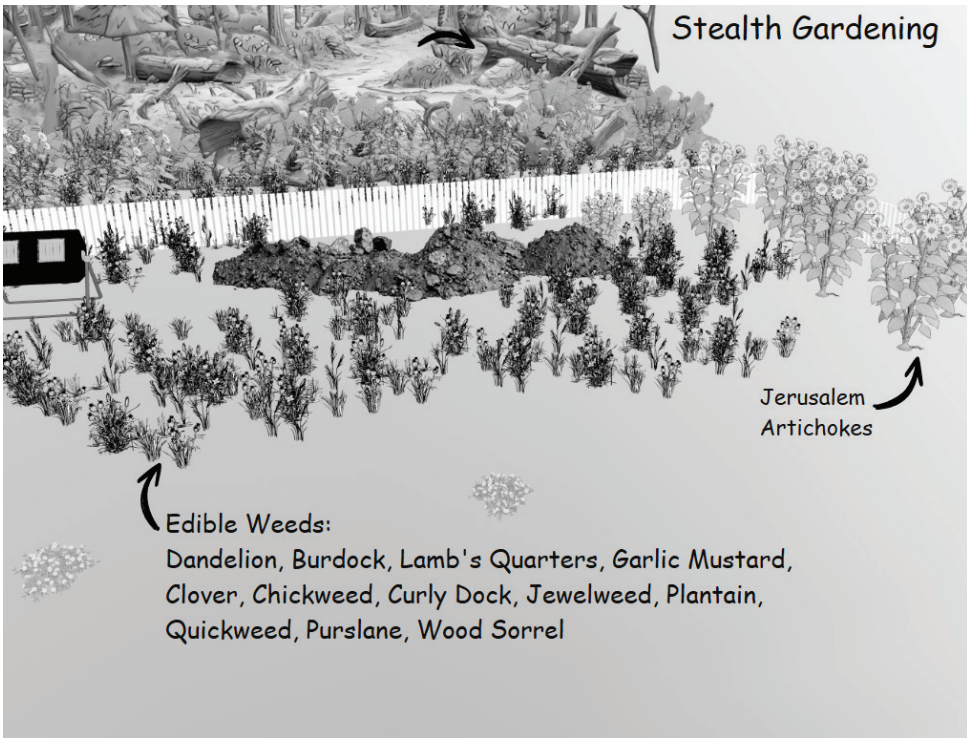


Don't overwater these plants. Tepary beans, cowpeas, black-eyed peas, purple hull peas, sorghum, and hot peppers like .5 inches of water even when it's 100F (38C). Malabar spinach, okra, sweet potatoes, callaloo amaranth, and yardlong beans, along with the rest, like 1 inch of water. To simplify all this, just don't give any of these fellas more than 1 inch. That's 20 gallons of water per 4x8 ft raised bed per week for 1 inch, or 75 liters.



Stealth Gardening

You can increase food security even more by cultivating weeds at the edge of your yard. While some weeds will overtake your entire space, others respond to management. They're often even sturdier than drought-tolerant plants and contain more nutrition. You can also sow them in the woods nearby for extra security. We'll talk about weeds in more detail later.



It's tempting to dedicate every foot of your yard to raised beds and row crops, but don't. Leave some space for flowers, weeds, bushes, and berries. You want to create some pollinator havens. They do a lot of work, including pest control.

Consider replacing your grass with clover. It will improve your soil. Bonus, it's also edible and great for pollinators.

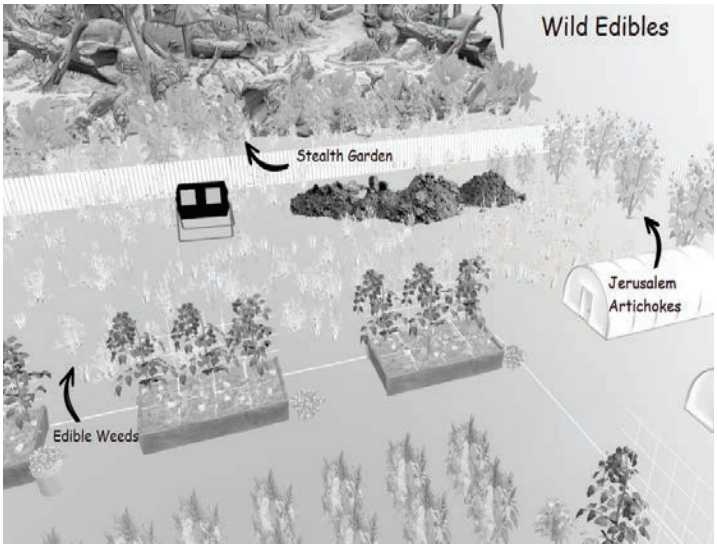
Wilds

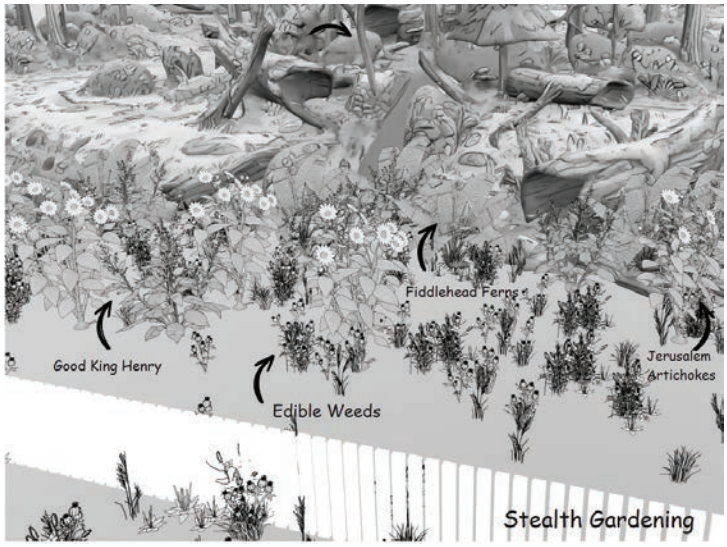
Jerusalem Artichokes can handle almost anything. They tend to harass your other vegetables, but they can hold their own in the ground near the weeds.

Further back, even behind your fence or any untended property, you can sew plants like Good King Henry and Ostrich Ferns (Fiddlehead).

Harvest the leaves of Good King Henry when it's young. Like spinach, too much can upset your stomach.

You can only eat the scrolls of fiddlehead ferns, and you must boil them first. Boil them for at least 10-15 minutes. You can also steam them 10-12. Discard the water afterward.





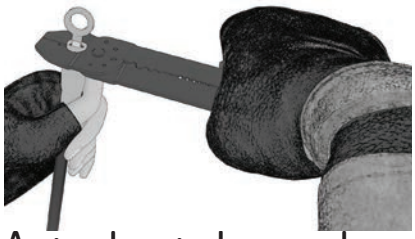
Wiring a Solar Drip Pump

This guide devotes an entire chapter to solar power systems and wiring. For now, we're going to do a short but important rundown on wiring, so you can connect your pump to your charge controller. It boils down to a few basic steps:

Stripping wires: Use wire strippers to remove the insulation from the end of the positive and negative wires from your pump.







Next, strip the ends of two more positive and negative wires (if you need more length).

Use the wire strippers to crimp terminal connections onto the ends of the extra wires. Make sure you get the kind that matches your battery terminals.

A ring terminal connector goes on battery terminals. When you're crimping, leave a little bit of wire uncovered by the insulation.

Sometimes, you'll need to splice two wires. Strip the ends. Slip them into a butt splice connector. Use a heat gun to shrink the seal.



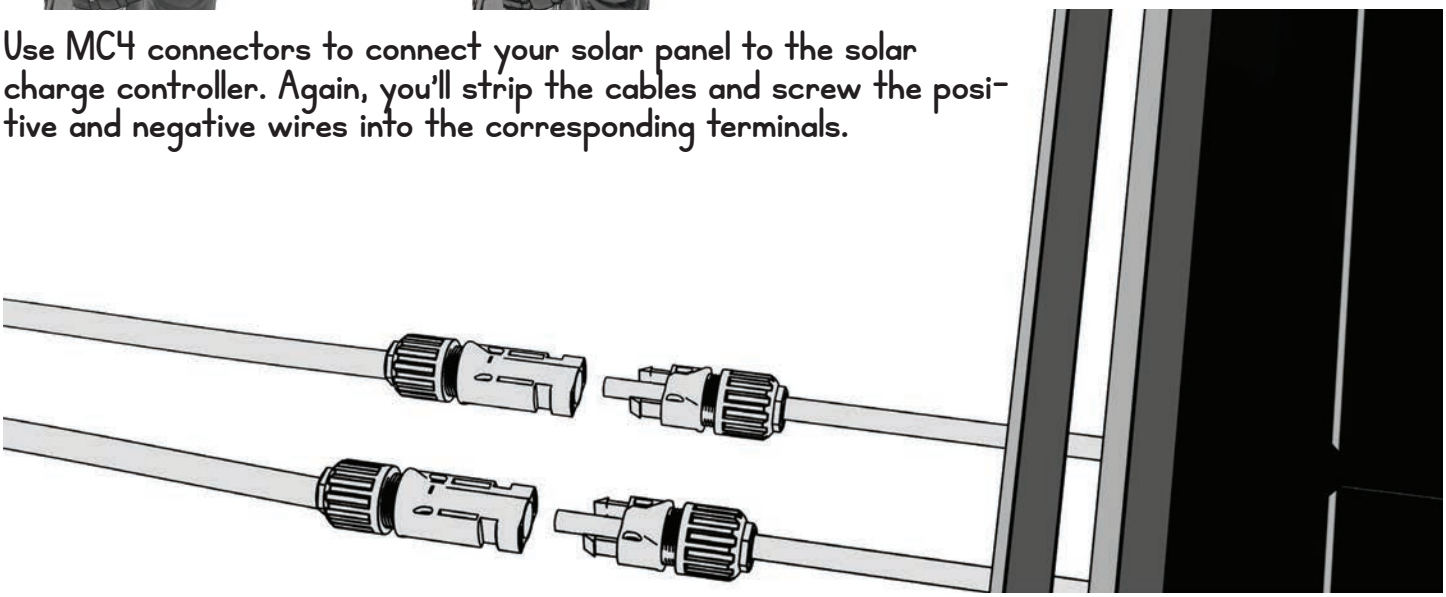






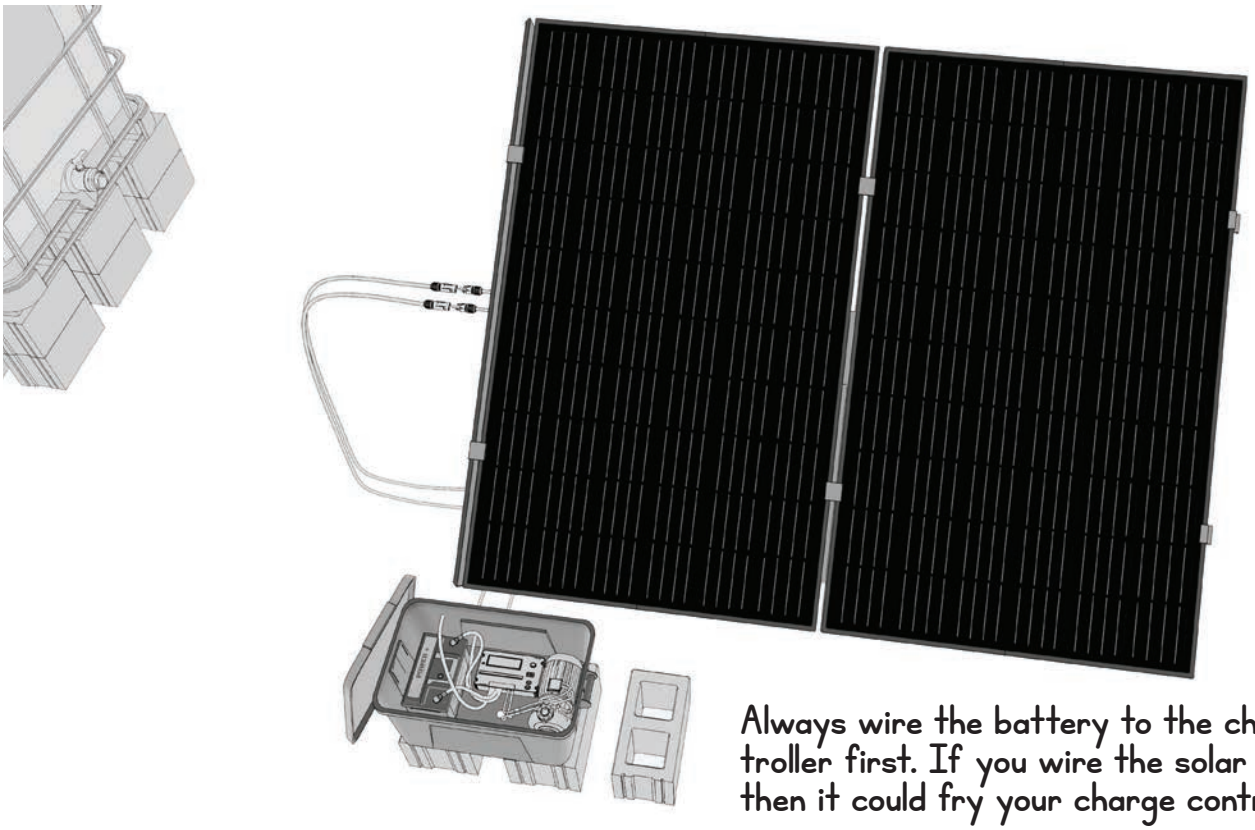
Always connect positive wires to positive terminals and negative wires to negative terminals. Otherwise, very bad things happen. They're almost always clearly marked. If they're not, don't risk it!

Use MC4 connectors to connect your solar panel to the solar charge controller. Again, you'll strip the cables and screw the positive and negative wires into the corresponding terminals.

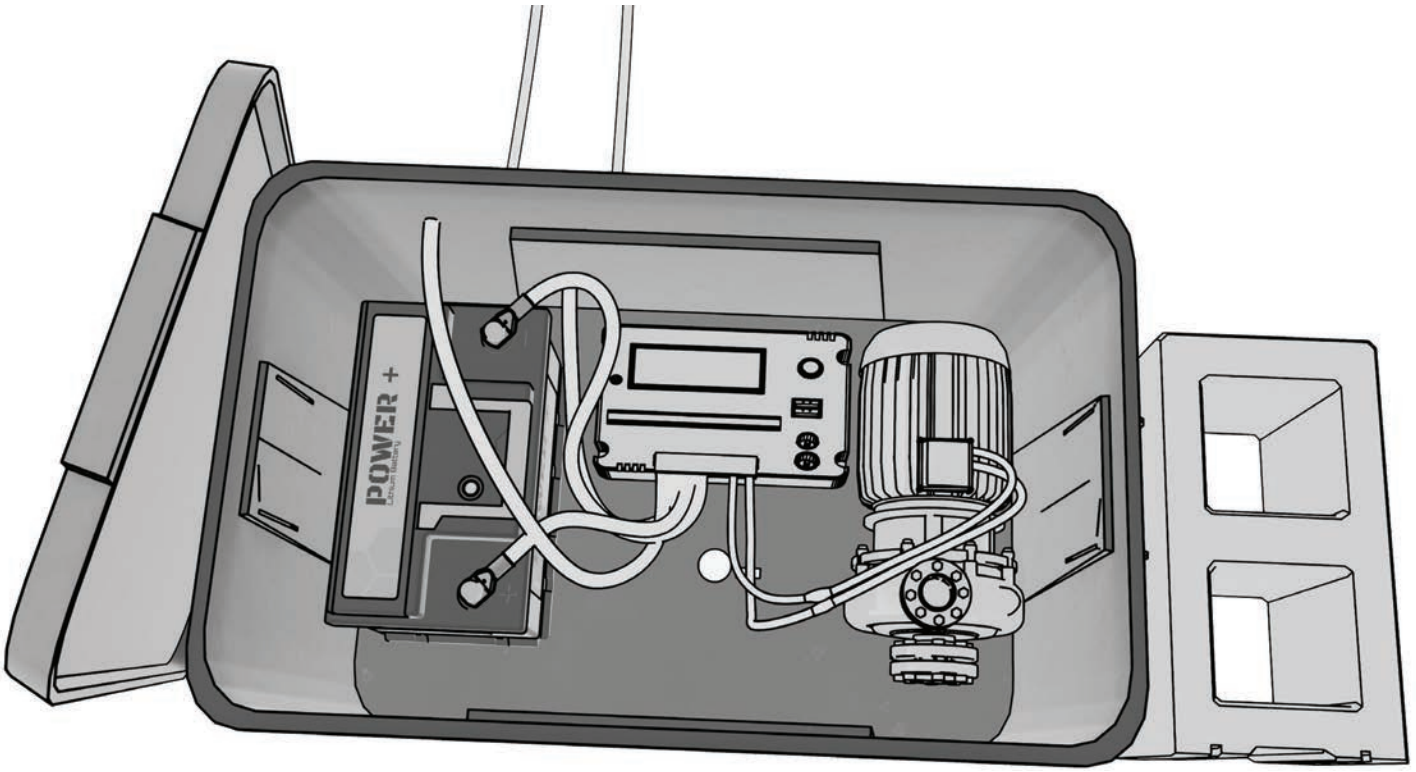


Wiring a Solar Drip Pump: Continued

Below, you see the finished setup. The solar panel sends electricity through the MC4 connectors to the charge controller. The charge controller sends electricity to your battery. It also routes electricity from the battery to any device you wire up, like a pump. The charge controller regulates everything and keeps it all from bursting into flames. We'll talk about it more later.



Always wire the battery to the charge controller first. If you wire the solar panel first, then it could fry your charge controller.



Growing in an Apartment

Even if you live in an apartment, you can still grow vegetables. You simply have to change strategies. You can grow herbs and microgreens in a window, on a patio, or on a balcony.



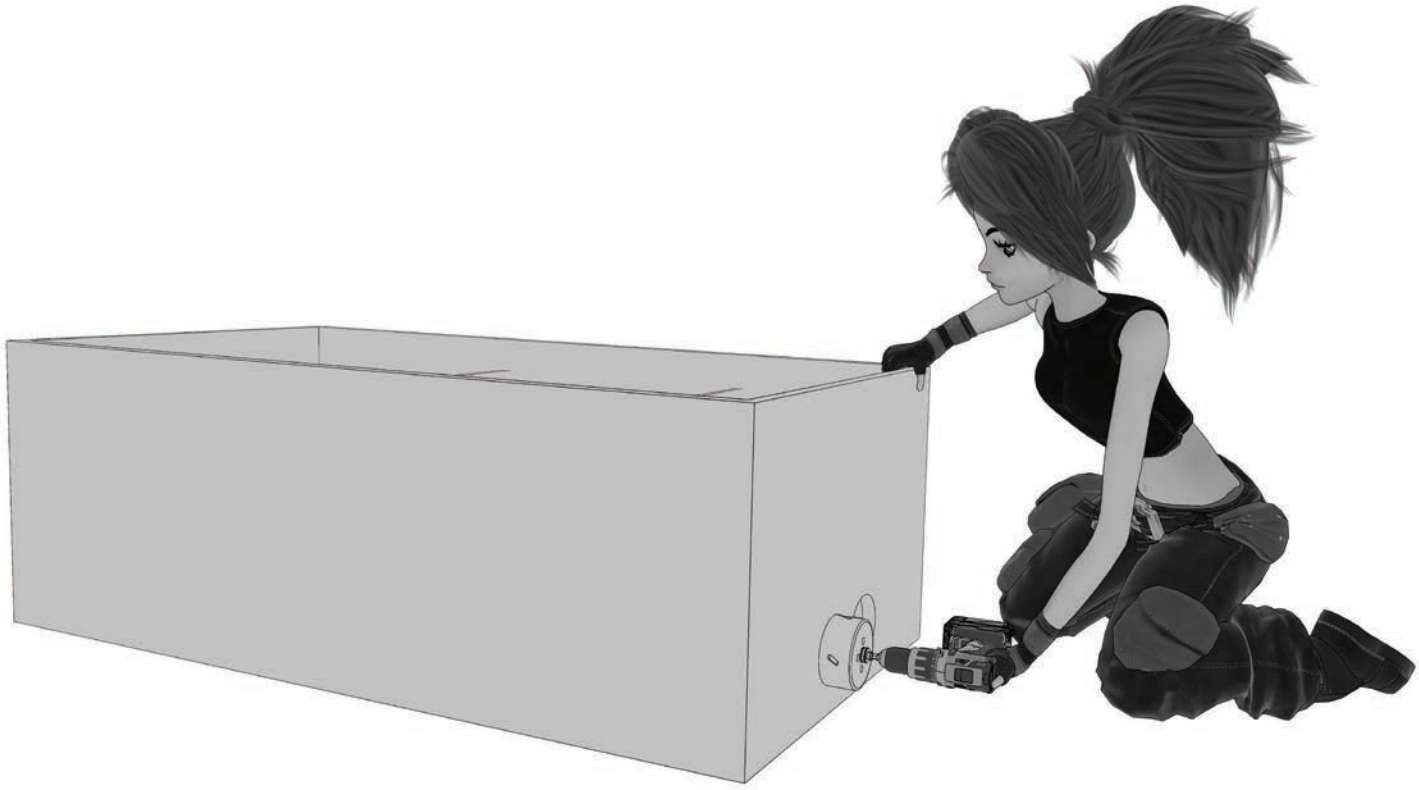
You can install window boxes. You can get railing planters, even deck planters that attach to edge beams. You can also grow plants indoors with grow lights and grow closets.



Grow closets make use of LED grow lights, usually 35 watts per square foot. They have vents at the sides and tops to facilitate airflow.

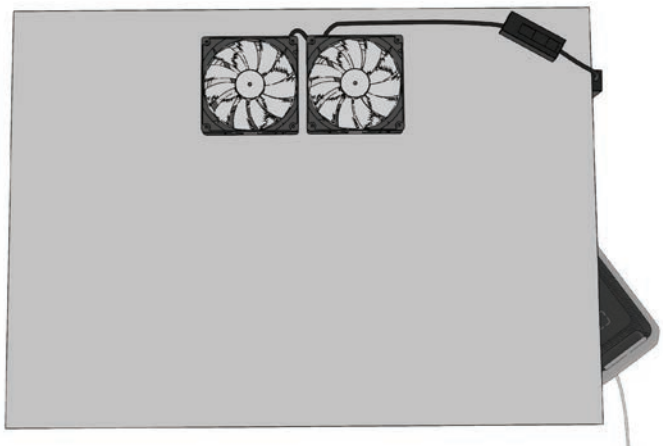
How to Make a Grow Closet

If you have limited windows and sunlight, you can still grow microgreens and herbs using grow lights. Some hardcore indoor growers use grow tents or even make grow closets to maximize control over the environment. You can make one by converting a cabinet or portable wardrobe. Use a hole saw to drill ports for the vents.



You'll also drill holes in the back to pass cables through for the grow lights. Hang the grow lights with screw hooks.

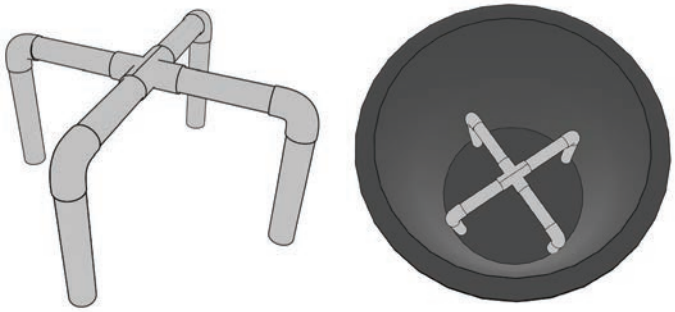




Mount PC cooling fans at the top. You can usually buy them in pairs or threes, with AC adapters for convenience.

How to Make a Self-Watering Planter

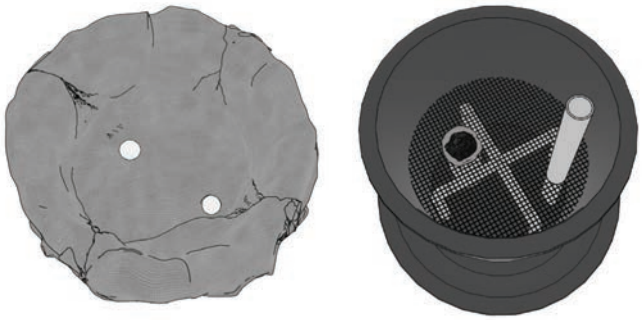
Self-watering planters can help you manage the mess of gardening and keep things neater. You pour water into a reservoir, and it travels back up through the soil via osmosis. You can make them yourself, even better than the ones sold in stores.



Start by making a base with PVC pipe, elbow fittings, and a cross fitting. Make it about 3 inches high.



Cut about 3 inches of PVC pipe. Put a cap on the bottom. Drill holes through it. Then make a liner with burlap roll. Stuff moist soil into this chamber.



Cut two holes into a sheet of burlap or any landscape fabric or netting that can hold soil.

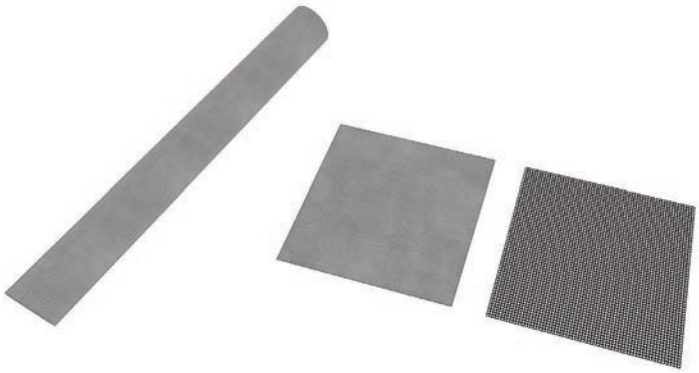


Drill an outlet hole about 3 inches high into your planter.

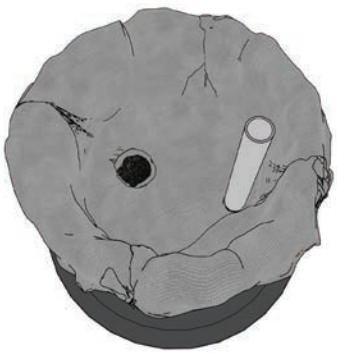




Cut a slant into a PVC pipe, tall enough so that it sticks up above your planter's rim.



Measure and cut some hardware cloth to fit over the base. Cut two holes for the chamber and watering pipe.



Put the burlap over the screen. Now add your soil. Water will move up from the reservoir through the dirt chamber, and your plant's roots will pull it up.

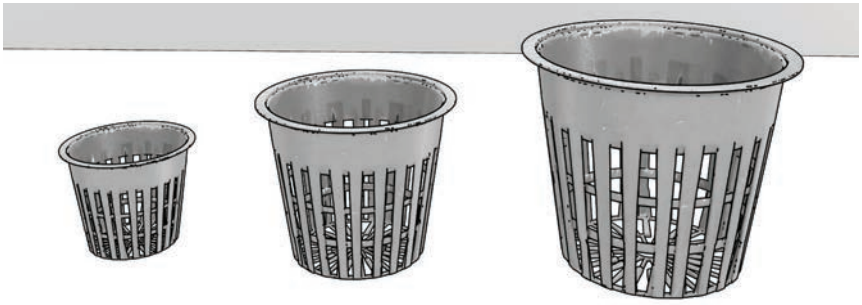
A Simple Hydroponics Setup

You can also ditch soil altogether indoors if you employ hydroponics. It sounds complicated, but the Kratky Method makes it possible without pumps or electricity. You simply start the plant, and then let it grow and occasionally top it off.





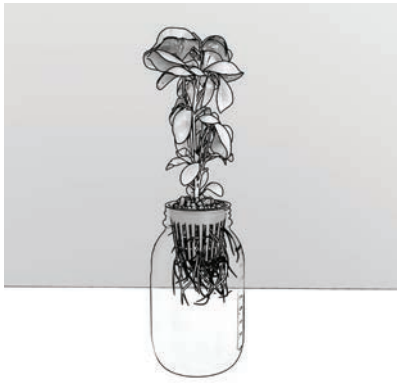
Start by filling some netting pots with clay pebbles called LECA (lightweight expanded clay aggregate). You can get these by the bag, and they don't cost much. They're reusable. If you want something even cheaper, you can use river pebbles and cheap plastic cups with holes drilled in them.



Net pots come in a variety of sizes, including one that fits jars.



Set the pot in a mason jar or another container. Fill it to the top with a nutrient mix. One of the most popular is called MasterBlend, which lasts indefinitely if stored in a cool dry place.



As the plant grows, the roots intake water and create a gap that allows oxygen to reach them. When you water it again, only fill it to the bottom of the net cup, to keep the gap.



You can also cover the jar with a sock or other material, to make a sleeve that blocks sunlight. This step helps prevent algae growth.

What works?

You can grow:

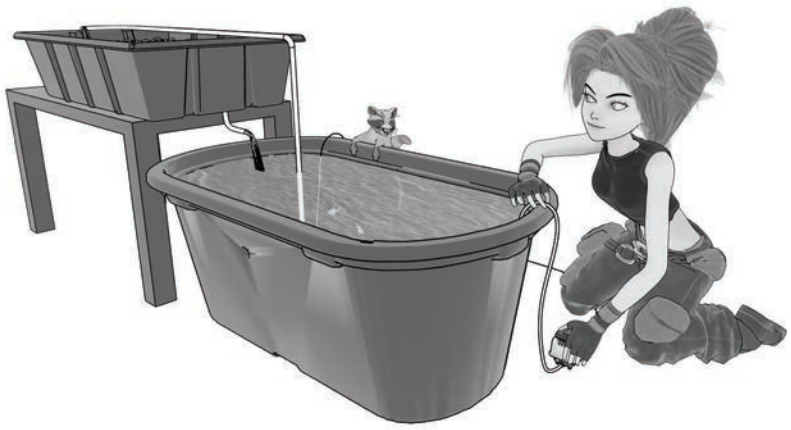
Kale
Spinach
Bok Choy
Arugula
Basil
Cilantro
Mint
Oregano
Parsley
Sage
Thyme

In buckets:

Onions
Zucchini
Eggplant
Tomatoes
Peppers
Cucumbers
Strawberries

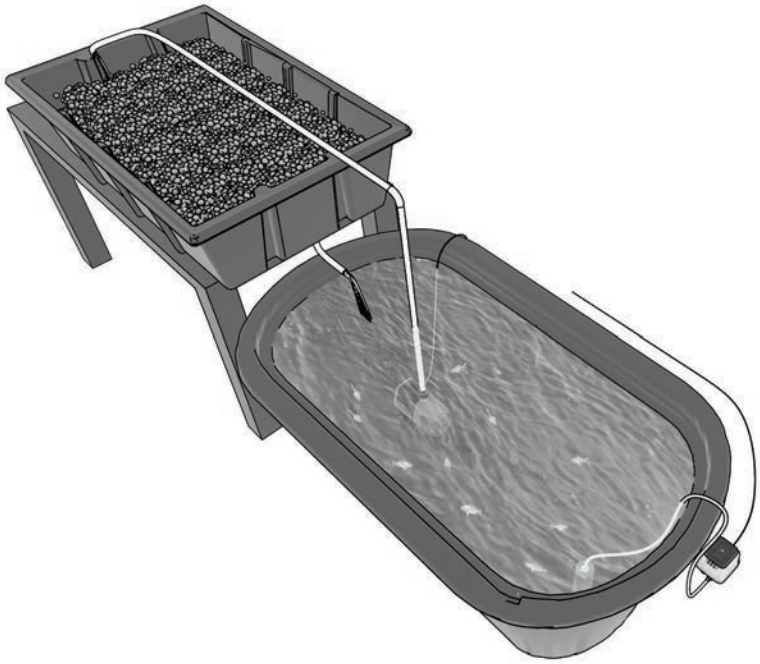
A Simple Aquaponics Setup

Many preppers and homesteaders maintain aquaponics setups to grow vegetables. They start small and go from there. Aquaponics appeals to us because the system forms a (mostly) self-contained cycle. Fish feed the plants, and then plants deliver clean water back to the fish. You can eat the fish, but you don't have to.

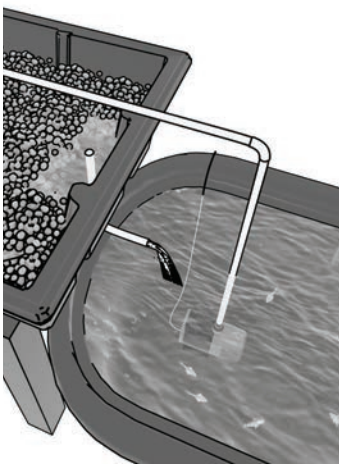


It doesn't take as much to set up an aquaponics system as many people think. To start, you just need these:

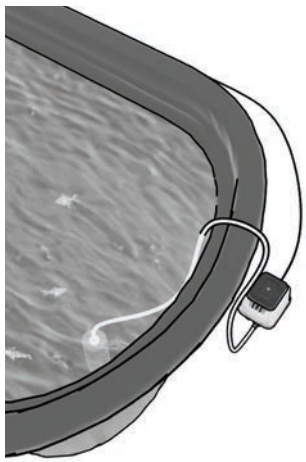
* A tank
* A grow bed
* A stand
* Water Pump
* Air Pump & Air Stone
* A Hole Saw
* PVC Pipe/Conduit



A water pump delivers water (and nutrient-rich waste) through a 1/4 or 1/2 inch PVC pipe to your grow bed. You can also use flexible irrigation hose. The grow bed fills to the level of your outlet pipe. Plant roots clean and filter the water, assisted by cultures of bacteria and other microorganisms that live on your substrate material. A timer controls the pump, shutting on and off in cycles to make sure water in the tank doesn't get too low. Like hydroponics, you can fill your bed with LECA (lightweight expanded clay aggregate). It makes an excellent substrate material for growth. Once it's setup, the tank needs a few weeks to cycle and build a basic level of bacteria before you start growing.



Your outlet pipe should stop about 2 inches from the surface of your substrate material. Water will rise to that level, feeding the roots of your plants, then it will drain back into your fish tank for another cycle. The pipe also needs a guard (see next page).



Your air pump will feed into at least one air stone, pushing pressurized oxygen through your water. This device keeps oxygen levels in your tank at their maximum level. That way, your fish breathe well and stay healthy. Shoot for 6 ppm (parts per million).

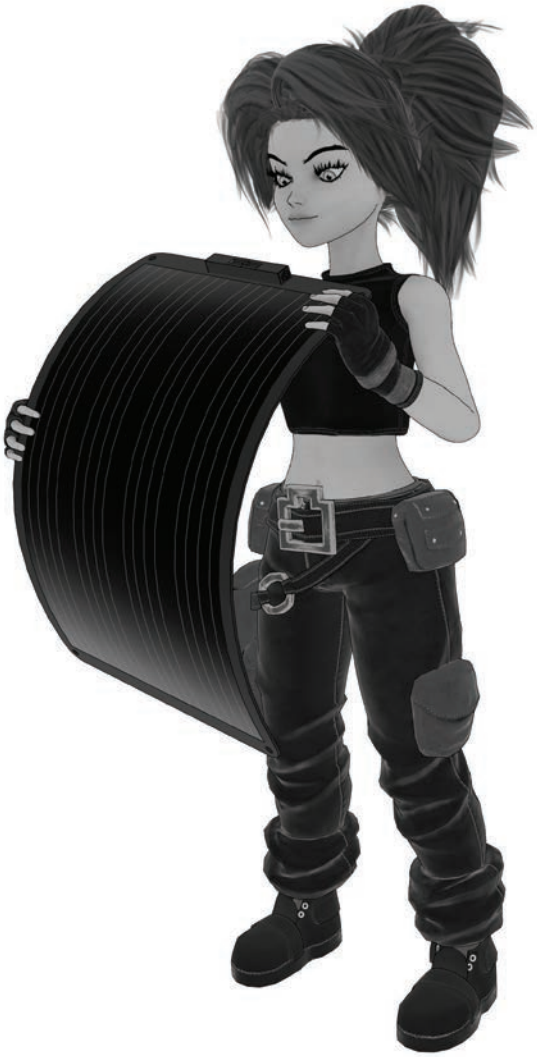
Some Aquaponics Essentials

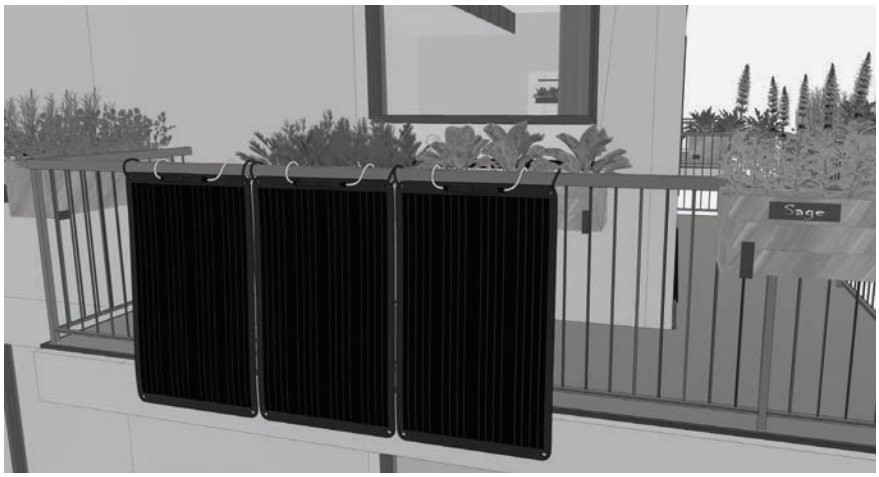


* At the beginning, follow a 1:1 ratio for your containers. Your fish tank container volume should be roughly equivalent to your grow bed. It simplifies things.
* Use sturdy, foodgrade materials. It's even okay to buy kits. Pre-made kits will save you a lot of time.
* With more experience, you can size grow beds and tanks more precisely. For every cubic foot of grow bed space, you need 7.5 gallons of fish tank. (1000 liters of tank for every cubic meter of grow bed.)
* When you're starting out, stick to these fish: Goldfish, tilapia, carp, catfish, and koi. They're the hardiest.
* Grow beds need to be at least 12 inches deep to facilitate the cycles and make for the easiest management.
* Aquaponics experts recommend a 50-gallon tank as the smallest size for beginners. It needs to be at least 18 inches deep. 100-250 gallons is fine.
* Search for "stock tanks" online. Rubbermaid makes very good ones.
* A bigger tank is better than a smaller one. Don't overcrowd your fish.
* Place your setup outdoors in the shade or indoors if possible. The water needs to stay below 100F (38C) to sustain oxygen levels. You can buy additional equipment to heat and cool your tank.
* Aquarium heaters do the best job at maintaining a warm water temperature.
* Maintain your tank pH at 6.5-7.5. Measure with digital meters and add buffering agents as needed to keep it neutral.
* The outlet pipe needs a guard to keep out roots and pebbles. It could be a simple, bigger pipe with a cap. Drill holes into it. Water will flow through the holes, but nothing big will enter.
* Keep the top 2 inches of your bed as dry as possible to control mold and algae. It also helps protect the roots.
* It's a good idea to buy a water pump with a timer to help you control the cycles. The bed needs to drain completely at intervals throughout the day in order for the roots to breathe. They need oxygen.
* Aquaponics experts recommend specialized, magnetic drive pumps made specifically for aquaponics systems. They're the most durable, and the best at delivering the nutrients to your grow bed.
* Choose a pump with a flow rate (GPH) that equals or exceeds the size of your tank. It needs to be able to cycle the entire volume in one hour or less. If you're running it for 10-15 minutes an hour, then it should pump 400 GPH. It's not hard to find affordable pumps with 1,000 GPH.

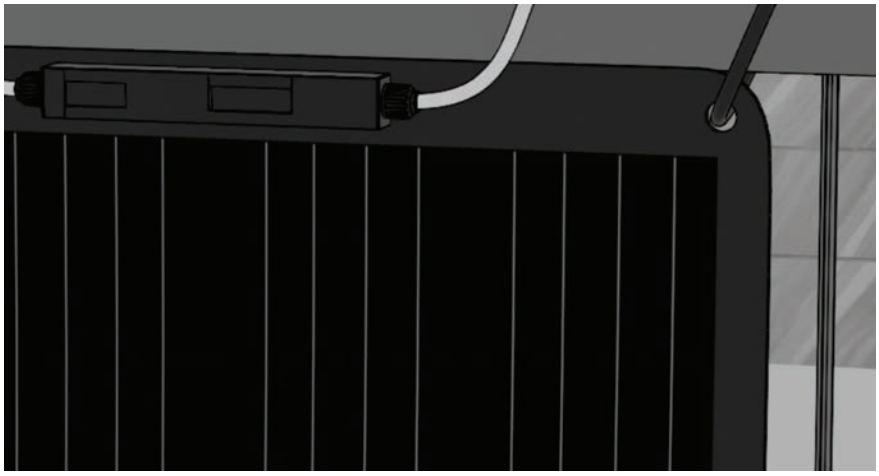
Solar Power in an Apartment?

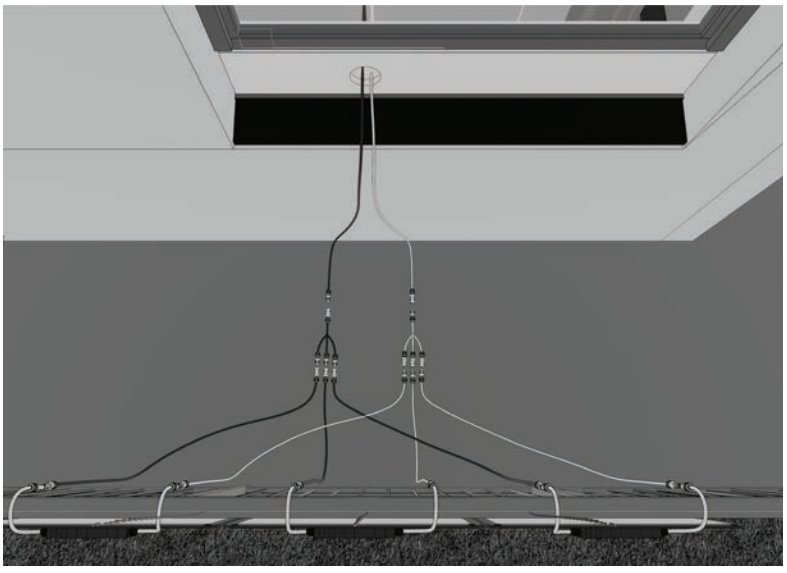
You can also harness solar power to run your indoor growing system. Companies have started making flexible solar panels that you can mount almost anywhere. Flexible solar panels can now provide anywhere from 100–300 watts per panel.





Use paracord to fasten the panels to a balcony rail or some other type of sturdy structure. Run the cord through the loop rings on the panel's edges.





Wire the panels in parallel, like it's shown in the section on solar panels. Then run them inside with a passthrough panel.

How to Manage Pests

You don't want to rely on chemicals to manage pests, because they eventually ruin your soil and also drive away helpful insects like pollinators. It's better to manage them through natural methods, especially companion planting.

Plant These To Control Different Pests

Marigolds	Aphids, Beetles, Many other Bugs, Rodents
Lavender	Mosquitoes, Moths, Fleas, Flies, Rodents
Daisies (Pyrethrum)	Mosquitoes, Flies, Mites, Many other Bugs
Chrysanthemums	Roaches, Ants, Ticks, Japanese Beetles
Nasturtiums	Aphids (Trap Crop), Beetles
Borage	Tomato Hornworms, Cabbage Worms
Catnip	Ants, Japanese Beetles, Squash Bugs, Roaches, Rodents
Lemon Grass	Mosquitoes, Other Bugs, Rodents
Daffodils	Mosquitoes, Other Bugs, Rodents

You can also plant a wide range of herbs to repel pests including basil, chives, mint, oregano, and rosemary. Chives and garlic do great against aphids. Thyme can repel deer. You can crush up daisies to make a powerful, natural insecticide. Sage, garlic, and onions also repel many pests, including rodents. Plant herbs like mint and rosemary in pots to keep them from spreading all over your garden.

Attract Helpful Predators

You can plant dill, yarrow, cosmos, and fennel to attract insects like ladybugs and lacewings that eat other pests. These plants also attract birds.

Use Organic Sprays

You can make sprays from castile soap that work on aphids, mites, and other bugs with soft bodies. Sprays with capsaicin works well to kill insects and repel rodents.

Use exclusion for bigger pests

You're going to encounter bigger pests like mice, rats, rabbits, raccoons, groundhogs, and squirrels. You can spray a hot pepper mix around the edge of your beds to ward some of them off. You can also make mesh barriers with 16-guage wire (thick enough to stop them). Unfortunately, "trap crops" and sacrificial edibles won't help with larger animals and could make the problem worse by attracting them and helping them multiply.

How to Save Seeds

If you're after true self-reliance, then you'll need to learn how to save seeds. It's not extremely hard, but you have to follow a few basic guidelines. Annual plants produce plants at the end of the season, but biennials usually need to go dormant in winter (overwinter) and then produce seeds the following spring. Heat can often trigger plants to bolt early and "go to seed," so plant them in spring and let them grow into the summer. You won't harvest any plants you let go to seed, and you normally only have to let a few plants seed to produce enough for future seasons. Most seeds will last a few years, up to 5 or 10 if you freeze them. If you're starting out, plant heirloom seeds only. Hybrid seeds can give you bad results. If you start with heirloom seeds, then you'll continue producing heirloom seeds every season.

Some plants will cross-pollinate and ruin each other. Expert gardeners know how to prevent this, but it requires skill and patience. It's easier to just know which plants you should avoid growing during the same season. In fact, cole crops cross-pollinate so much, many experienced gardeners don't even bother trying to manage them.

Don't Plant These Together if You Want Seeds

Squash 1	Zucchini, Yellow Crookneck, Acorn Squash, Delicata, Spaghetti Squash, Pumpkin
Squash 2	Butternut Squash, Tromboncino, Long Island Cheese Pumpkin
Squash 3	Hubbard Squash, Buttercup, Kabocha, Giant Pumpkin
Cole Crops 1	Broccoli, Cabbage, Cauliflower, Kale, Brussels Sprouts, Kohlrabi, Collards
Cole Crops 2	Turnips, Bok Choy, Mizuna

General Process for Saving Seeds

* Bolt: Let the plant form flowers.
* Dry 1: Let the pods dry out until they become tan and brittle.
* Dry 2: Cut the entire plant and store it somewhere dry for another 1-2 weeks.
* Thresh: Rub or shake the pods to release the seeds.
* Winnow: Sift and separate seeds from chaff/pod husks with a screen or colander, or by hand.
* Store: Collect the seeds in a seal envelope in a metal container or something similar.
* Seeds last 2-5 years on average.

In general, collect seeds by harvesting the pods or even uprooting the entire plant if you want to make sure it dries out in a controlled environment (like a greenhouse or garage). You'll let the plant dry for 1-2 weeks, then crush the pods and sift out the seeds. Always dry seeds away from direct sunlight. For wet seed collecting from plants like squash, cucumber, and tomato, let them sit in water for a few days. It's called fermenting. It helps remove gel coating that keeps seeds from germinating. In natural settings, the gel wears off as animals eat and spread the seeds. In our case, we want to remove it as soon as possible. Afterward, scrape off the top mush and then spread them out on a plate or rack to dry. Make sure you label as you go.

Herbs: Arugula

Pollination: Self
Lifespan: Annual

When to Plant

Start early if planting outdoors, 2-3 weeks before last frost. You can also plant in mid or late fall for an early winter harvest. Start seedlings every 2-3 weeks for continuous harvest.

How to Plant

Plant seeds 1/4 inch deep, 1-2 inches apart and thin later or plant 4-6 inches apart. If you're planting outside, make 10-12 inches between rows. For square foot gardening, plant 9-16 per square foot for baby arugula and less if you want it to grow bigger.

How Long It Takes

Produces food in 30-40 days (1-2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 60-70F.
Water: 1-2 inches per week.
Soil pH: 6-7

Harvesting

Pinch or cut above leaf nodes. Harvest outer leaves first. Harvest leaves when they're young for best taste, when they're 2-3 inches long. Harvest about once a week, up to 3 times before bolting.

Yield

A single complete harvest of one plant can produce up to 2 ounces. Continuous harvest produces more over a longer period.

Nutritional Value

Vitamin K (100% DV), Vitamin A (47% DV), Vitamin C (47% DV), B9 (24% DV)
25 Calories per cup



Preserving

Wash and dry leaves, then place in a dehydrator at 95F for 4-6 hours, 12 hours max. You can also use an oven at 150-200F for 1-3 hours.

Collecting Seeds

Let the plant bolt. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Hang the stalk in a paper bag for 1-2 weeks. Thresh and winnow, then store in a cool dry container.

Good Companion Plants

Garlic, onions, beans, cucumber, beets, lettuce, spinach, celery, other herbs

Notes

Like many plants, arugula benefits from good air flow and moist soil, but moist leaves can lead to mildew and rot.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Herbs: Basil

Pollination: Self
Lifespan: Annual

When to Plant

Start seedlings 4-6 weeks before last frost if planting outside. Start seedlings every 2-3 weeks for continuous harvest.

How to Plant

Plant seeds 1/4 inch deep, 6-12 inches apart. If you're planting outside, make rows 18-36 inches apart. For square foot gardening, plant 1-4 per square foot.

How Long It Takes

Produces food in 30-40 days (1-2 months).

Care/Best Growing Conditions

Sun: 6-8hours full sun.
Temperature: 65-80F.
Water: 1-2 inches per week.
Soil pH: 6-7

Yield

A single complete harvest of one plant can produce up to 13 ounces. Continuous harvest produces more over a longer period.

Harvesting

Pinch or cut above leaf nodes. Harvest outer leaves first. Harvest up to a third of the plant. Pinch off flowers to maintain taste.

Nutritional Value

Vitamin A (3% DV), Vitamin K (43% DV), Calcium (4% DV), Iron (5% DV), Manganese (3% DV)
5 calories per tablespoon



Preserving

Wash and dry leaves, then place in a dehydrator at 95F for 2-4 hours, 8 hours max. You can also use an oven at 170F for 1 hour.

Collecting Seeds

Let the plant bolt. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Hang the stalk in a paper bag for 1-2 weeks. Thresh and winnow, then store in a cool dry container.

Good Companion Plants

Onions, radishes, carrots, tomatoes, peppers, oregano, marigolds, chamomile.

Notes

Basil also helps deter pests like aphids and mosquitoes. It attracts pollinators and other beneficial insects. Many herbalists consider basil highly effective at lowering blood pressure.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
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0 Degrees F = -17.8C
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90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Herbs: Dill



Pollination: Self
Lifespan: Annual

When to Plant

Start seedlings 4-6 weeks before last frost if planting outside. Start seedlings every 2-3 weeks for continuous harvest.

How to Plant

Plant seeds 1/4 inch deep, 9-12 inches apart. If you're planting outside, make rows 12-24 inches apart. For square foot gardening, plant 4-9 per square foot.

How Long It Takes

Produces food in 30-60 days (1-2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 60-70F.
Water: 1-2 inches per week.
Soil pH: 6-7

Harvesting

Pinch or cut above leaf nodes. Harvest outer leaves first. Harvest up to a third of the plant at a time, and pinch off flowers.

Yield

A single complete harvest of several plants can produce up to 1 ounce. Continuous harvest produces more over a longer period.

Nutritional Value

Vitamin C (8% DV), Manganese (5% DV), Vitamin A (4% DV), Folate (3% DV), Iron (3% DV)
4 Calories per cup

Preserving

Wash and dry leaves, then place in a dehydrator at 95F for 2-6 hours, 12 hours max. You can also use an oven at 100-115F for 1-4 hours.

Collecting Seeds

Let the plant bolt. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Hang the stalk in a paper bag for 1-2 weeks. Thresh and winnow, then store in a cool dry container.

Good Companion Plants

Broccoli, kale, cabbage, cucumbers, lettuce, onions, asparagus, basil, marigolds, tomatoes.

Notes

Dill also helps deter pests like aphids and cabbage worms.

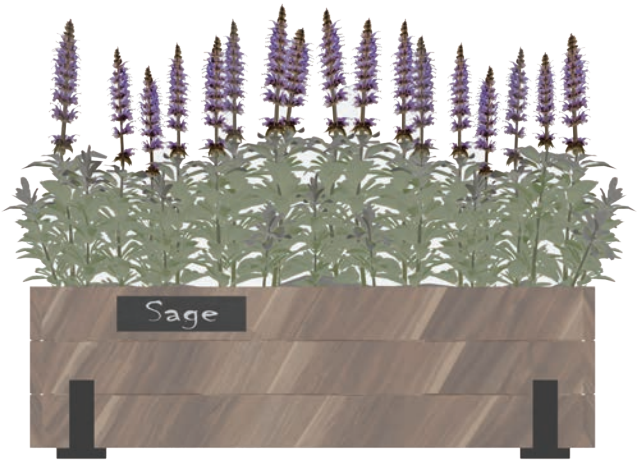
Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Herbs: Sage

Pollination: Self
Lifespan: Perennial



When to Plant

Start seedlings 4-6 weeks before last frost if planting outside. Start seedlings every 2-3 weeks for continuous harvest.

How to Plant

Plant seeds 1/4 inch deep, 12 to 36 inches apart. If you're planting outside, make rows 18 to 36 inches apart. For square foot gardening, plant 1-2 per square foot.

How Long It Takes

Produces food in 60-70 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 65-80F.
Water: 1-2 inches per week.
Soil pH: 6-7

Harvesting

Pinch or cut above leaf nodes. Harvest outer leaves first. Harvest up to a third of the plant at a time, and pinch off flowers.

Yield

A single complete harvest of one plant can produce up to 2 ounces. Continuous harvest produces more over a longer period.

Nutritional Value

Vitamin K (10% DV), Iron (1% DV), Calcium (1% DV), Magnesium (1% DV), Antioxidants
2 Calories per cup

Preserving

Wash and dry leaves, then place in a dehydrator at 95F for 2-4 hours, 8 hours max. You can also use an oven at 150-200F for 1-4 hours.

Collecting Seeds

Let the plant bolt. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Hang the stalk in a paper bag for 1-2 weeks. Thresh and winnow, then store in a cool dry container.

Good Companion Plants

Cabbage, broccoli, kale, tomatoes, lavender, rosemary, thyme, marigolds, nasturtiums, yarrow.

Notes

Like other herbs, sage helps deter a variety of pests. They attract beneficial insects like bees and butterflies.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Herbs: Rosemary

Pollination: Self
Lifespan: Perennial

When to Plant

Start seedlings 4-6 weeks before last frost if planting outside. Start seedlings every 2-3 weeks for continuous harvest.

How to Plant

Plant seeds 1/4 inch deep, 24-36 inches apart. If you're planting outside, make rows 24 to 36 inches apart. For square foot gardening, plant 1-2 per square foot.

How Long It Takes

Produces food in 6-12 months.

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-85F.
Water: 1-2 inches per week.
Soil pH: 6-7

Harvesting

Cut 2-8 inches of newer stems, just above leaf node. Don't harvest more than 1/3 of the plant at once.

Yield

A single complete harvest of one plant can produce up to 16 ounces or more. Continuous harvest produces more over a longer period.

Nutritional Value

Calcium, Potassium, Magnesium, Phosphorus, Iron, Vitamin A, Vitamin C, Vitamin B6, B9
11 Calories per cup



Preserving

Wash and dry leaves, then place in a dehydrator at 95-115F for 2-12 hours, 12 hours max. You can also use an oven at 170-200F for 1-2 hours.

Collecting Seeds

Let the plant bolt. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Hang the stalk in a paper bag for 1-2 weeks. Thresh and winnow, then store in a cool dry container.

Good Companion Plants

Beans, cabbage, broccoli, carrots, brussels sprouts, peppers, onions, strawberries, marigolds, zinnias, alyssum

Notes

You can make a natural pest repellent from rosemary by boiling for 30 minutes, then straining it. You can use it on plants.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Herbs: Parsley

Pollination: Self
Lifespan: Biennial

When to Plant

Start seedlings 4-6 weeks before last frost if planting outside. Start seedlings every 2-3 weeks for continuous harvest.

How to Plant

Plant seeds 1/4 inch deep, 5 to 12 inches apart. If you're planting outside, make rows 12 to 18 inches apart. For square foot gardening, plant 1-4 per square foot.

How Long It Takes

Produces food in 70-90 (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 50-75F.
Water: 1-2 inches per week.
Soil pH: 6-7

Harvesting

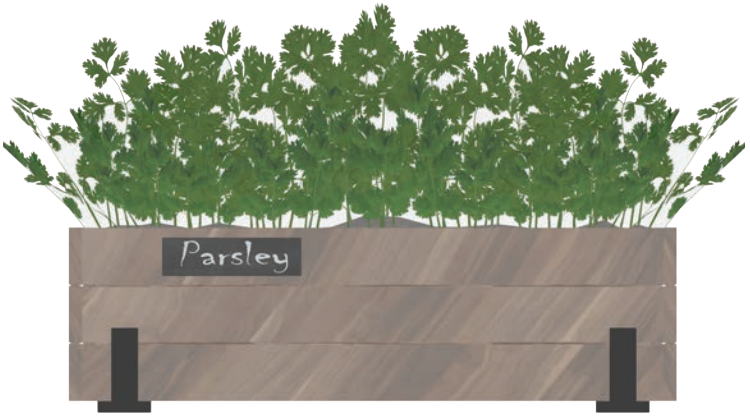
Cut or pinch outer, lower leaves near the base. Don't harvest more than 1/3 of the plant at once.

Yield

A single complete harvest of one plant can produce up to 16 ounces. Continuous harvest produces more over a longer period.

Nutritional Value

Vitamin A (12% DV), Vitamin C (16% DV), Vitamin K (154% DV)
2 Calories per cup



Preserving

Wash and dry leaves, then place in a dehydrator at 95-100F for 2-10 hours, 10 hours max. You can also use an oven at 170F for 1 hour.

Collecting Seeds

Let the plant bolt. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Hang the stalk in a paper bag for 1-2 weeks. Thresh and winnow, then store in a cool dry container.

Good Companion Plants

Tomatoes, asparagus, marigolds, corn onions, peppers, thyme, chives, basil, oregano, lavender, mint

Notes

Like other herbs, parsley repels a variety of pests, especially asparagus beetles and aphids. It can also attract ladybugs and parasitic wasps, as well as other predators. Like basil, parsley can also help lower blood pressure.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Amaranth (Callaloo)

Pollination: Wind
Lifespan: Annual

When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through mid-summer for continual harvest. You can also plant in late summer for a fall harvest. Frost kills.

How to Plant

Plant seeds 1/4 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start in a greenhouse or warm windowsill. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 3-4 days.
Outdoors: Plant after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches (for grains, full size); 4-6 inches (for greens).
Between rows: 18-24 inches.
By square foot: 1 per square foot (full size); 4-9 per square foot (harvested early for greens).

How Long It Takes

Produces food in 30-40 days (for greens) or 90-120 days (for grain).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-85°F. Extremely heat and drought tolerant; highly sensitive to frost.
Water: 1 inch per week (needs very little water once established).
Soil pH: 6.0-7.5
Common pests: Flea beetles, leaf miners, aphids, tarnished plant bugs, slugs.

Harvesting

Harvest leaves when young, 4-6 inches long. Pinch or cut outer leaves first, 2-3 inches above the soil line, or harvest entire top of the plant to encourage branching. For grain, harvest the entire seed head in late summer/fall after flowers fade and seeds rattle when shaken.



Amaranth

Storing (Refrigerate)

Don't wash. Store greens in a perforated bag in a cool, humid place away from ethylene-producing fruits. Add a paper towel to absorb moisture. Use within 3-5 days.
Long term: Blanch leaves for 2 minutes, plunge in ice water, dry, and freeze for up to a year. Store dried grain seeds in an airtight container in a cool, dark pantry for up to 1-2 years.

Collecting Seeds

Let the plant mature and produce large flower plumes. Let them dry on the stalk until they begin to turn brown and brittle. Cut the seed heads and dry them indoors in a paper bag for 1-2 weeks. Rub or crush the flower heads over a bucket to release the seeds, then winnow (blow away) the light chaff. Store seeds in envelopes or airtight glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Amaranth loves hot weather. It's a heavy nitrogen feeder during early growth; side-dress with compost or organic fertilizer 3-4 weeks after transplanting. Does well in poor soil. Drain it.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Beans (General)

Pollination: Self
Lifespan: Annual

When to Plant

Start seedlings 2-4 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 3-4 square inches. Thin after sprouting.
Between plants: 3-4 inches.
Between rows/trellises: 18-24 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 90-120 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-85F.
Water: 1-2 inches per week.
Soil pH: 6-7
Common pests: Aphids, spider mites, bean beetles, leafhoppers, stink bugs, thrips, weevils.

Harvesting

Wait for leaves to drop. Pick the pods and let them dry further on a tray or rack. You can also pull the entire plant and hang it somewhere dry with good air flow. Shell them into a container. Drying takes 2-3 weeks.



Storing

After harvesting, dry beans for an extra week. Test humidity. It should be 10-12 percent. If you hit them with a hammer, the beans should crack, not crush. Store in a cool, dry place.

Collecting Seeds

Let bean pods dry until they're brittle. If you expect wet or humid weather, cut an entire stalk and let it dry indoors. Harvest the pods and shell them, then let them dry an additional 1-2 weeks. Store them in envelopes or glass/ metal containers with silica gel packs. Beans last 3-5 years.

Notes

It's best to plant beans directly in the ground after last frost. Plant 3-4 seeds at the base of trellises 24-36 inches apart. Good for soil. Add nitrogen to the ground.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Black Turtle Beans

Pollination: Self
Lifespan: Annual

When to Plant

Direct sow outdoors after all danger of frost has passed and soil temperature reaches 65–70°F. Highly frost sensitive and does not tolerate transplanting.

How to Plant

Plant seeds 1 inch deep.
Indoors: Not recommended due to fragile taproots.
Outdoors: Sow directly into loose, well-draining soil. Plant 1 seed every 3 inches, then thin to strongest seedlings.
Between plants: 3–4 inches (bush varieties); 6 inches (vining types).
Between rows: 18–24 inches.
By square foot: 4–9 plants per square foot.

How Long It Takes

Produces snap beans in 50–60 days; produces dry black beans in 85–100 days.

Care/Best Growing Conditions

Sun: 6–8 hours full sun.
Temperature: 70–85°F. Highly heat tolerant; prolonged temperatures above 90°F can cause blossoms to drop.
Water: 1 inch per week. Keep soil evenly moist during flowering and pod development; avoid overhead watering.
Soil pH: 6.0–6.8
Common pests: Bean beetles, aphids, leafhoppers, spider mites, root rot, powdery mildew.

Harvesting

For dry beans, leave pods on the vine until they turn straw-colored, dry, and brittle, and seeds rattle inside. Harvest the entire pod before autumn rains set in.



Storing

Do not refrigerate dry beans. Store thoroughly dried shelled beans in an airtight container in a cool, dark, dry pantry. Lasts 1–2 years.
Long term: Keep dry shelled beans in sealed mylar bags with oxygen absorbers for 5–10+ years of storage.

Collecting Seeds

Harvest naturally dried pods from the healthiest plants at the end of the season. Shell the pods by hand to collect the hard, black seeds. Freeze seeds for 48 hours to kill any potential weevil larvae, then store in airtight containers with silica gel packs. Seeds last 3–4 years.

Notes

A classic high-protein, bush-type (or short-pole) legume. As a nitrogen-fixer, it improves soil quality and makes an excellent companion for heavy feeders like corn or amaranth. Avoid high-nitrogen fertilizers, which trigger excess foliage growth instead of bean pods.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Black-Eyed Peas

Pollination: Self
Lifespan: Annual

When to Plant

Direct sow outdoors 2-3 weeks after the last spring frost once soil is thoroughly warm (70°F+). Highly frost sensitive and does not tolerate transplanting.

How to Plant

Plant seeds 1 inch deep.
Indoors: Not recommended due to sensitive taproots.
Outdoors: Sow directly into well-drained soil. Plant 1 seed every 3 inches, then thin to strongest seedlings.
Between plants: 3-4 inches (bush types); 6 inches (vining types).
Between rows: 24-30 inches.
By square foot: 4-9 plants per square foot.

How Long It Takes

Produces green pods in 60-70 days; produces dry peas in 85-100 days.

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-95°F. Extremely heat and drought tolerant; thrives in conditions where other beans wither.
Water: 1 inch per week. Very low water needs once established; avoid waterlogging the soil.
Soil pH: 5.5-6.5 (tolerates poor, sandy, low-fertility soils well).
Common pests: Cowpea curculio, aphids, stink bugs, root-knot nematodes.

Harvesting

For fresh peas, pick pods when they are plump but still green. For dry peas, leave pods on the vine until they turn tan, dry, and brittle, and the seeds rattle inside.



Storing

Store fresh, unwashed green pods in a paper bag in the crisper drawer; use within 3-5 days. Do not refrigerate dry shelled peas.
Long term: Store dry shelled peas in an airtight container in a cool, dark pantry for 1-2 years.

Collecting Seeds

Harvest naturally dried, brittle pods from healthy vines. Shell by hand to collect the hard, cream-colored seeds with black eyes. Freeze for 48 hours to kill weevil larvae, then store in airtight glass jars with silica gel packs. Seeds last 3-4 years.

Notes

Also known as Cowpeas (Vigna unguiculata). Highly effective nitrogen-fixer that improves poor soils. Excellent heat-tolerant summer cover crop or companion for corn and sorghum. Avoid high-nitrogen fertilizers, which cause excessive vine growth instead of pods.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Green Snap Beans

Pollination: Self
Lifespan: Annual



When to Plant

Direct sow outdoors after all danger of frost has passed and soil temperature reaches 60–70°F. Plant successions every 2 weeks until mid-summer for continuous harvest. Highly frost sensitive.

How to Plant

Plant seeds 1 inch deep.
Indoors: Not recommended due to fragile root systems.
Outdoors: Sow directly into loose, well-draining soil. Plant 1 seed every 2–3 inches, then thin to strongest seedlings.
Between plants: 2–3 inches (bush varieties); 4–6 inches (pole/vining types).
Between rows: 18–24 inches (bush); 30–36 inches (pole).
By square foot: 4–9 plants per square foot (bush); 4–8 per square foot (pole with trellis).

How Long It Takes

Produces food in 50–60 days (bush varieties) or 60–70 days (pole varieties).

Care/Best Growing Conditions

Sun: 6–8 hours full sun.
Temperature: 65–85°F. Prolonged temperatures above 90°F can cause blossoms to drop and reduce yield.
Water: 1–1.5 inches per week.
Soil pH: 6.0–6.8
Common pests: Mexican bean beetles, aphids, leafhoppers, spider mites, slugs, powdery mildew, bean rust.

Harvesting

Harvest pods when they are firm, crisp, and fully elongated (typically pencil-thick) but before the seeds inside begin to bulge significantly. Snap or cut from the plant carefully to avoid tearing the vines. Harvest every 2–3 days to stimulate continuous production.

Storing

Store unwashed pods in a plastic or paper bag in the crisper drawer. Keep dry to prevent molding. Use within 5–7 days.
Long term: Trim ends, cut to desired length, blanch for 3 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Allow chosen pods to remain on the plant until they turn completely tan, dry, and brittle, and the seeds rattle inside. Shell by hand. Freeze the hard seeds for 48 hours to eliminate any hidden weevil larvae. Store in airtight containers with silica gel packs. Seeds last 3–4 years.

Notes

Available bush types or climbing pole types (which require a trellis). As nitrogen-fixers, they are exceptional companion plants for heavy feeders like corn, squash, and brassicas. Avoid high-nitrogen fertilizers, as it hurts bean growth.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Pinto Beans

Pollination: Self
Lifespan: Annual

When to Plant

Direct sow outdoors after all danger of frost has passed and soil temperature reaches 65–70°F. Highly frost sensitive and does not tolerate transplanting.

How to Plant

Plant seeds 1 inch deep.
Indoors: Not recommended due to sensitive root systems.
Outdoors: Sow directly into loose, well-draining soil. Plant 1 seed every 3 inches, then thin to strongest seedlings.
Between plants: 3–4 inches (bush varieties); 6 inches (vining/pole types).
Between rows: 18–24 inches.
By square foot: 4–9 plants per square foot.

How Long It Takes

Produces snap beans in 50–60 days; produces dry pinto beans in 90–100 days.

Care/Best Growing Conditions

Sun: 6–8 hours full sun.
Temperature: 70–85°F. Highly heat tolerant; prolonged temperatures above 90°F can cause blossoms to drop.
Water: 1 inch per week. Keep soil evenly moist during flowering and pod development; avoid overhead watering.
Soil pH: 6.0–6.8
Common pests: Mexican bean beetles, aphids, leafhoppers, spider mites, root rot, white mold.

Harvesting

For dry beans, leave pods on the vine until they turn tan, dry, and brittle, and the mottled seeds rattle inside. Harvest all dry pods before autumn rains set in.



Storing

Do not refrigerate dry beans. Store thoroughly dried shelled beans in an airtight container in a cool, dark, dry pantry. Lasts 1–2 years.
Long term: Store dry shelled beans in sealed mylar bags with oxygen absorbers for 5–10+ years of long-term storage.

Collecting Seeds

Harvest naturally dried, brittle pods from healthy plants. Shell the pods by hand to collect the speckled brown seeds. Freeze seeds for 48 hours to eliminate hidden weevil larvae, then store in airtight containers with silica gel packs. Seeds last 3–4 years.

Notes

Available in both bush and half-runner varieties. As a nitrogen-fixer, it improves soil fertility, making it an excellent companion crop for heavy feeders like corn or squash. Avoid high-nitrogen fertilizers, which cause excessive leaf growth instead of bean pods.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Purple Hull Peas

Pollination: Self
Lifespan: Annual

When to Plant

Direct sow outdoors 2-3 weeks after the last spring frost once soil is thoroughly warm (70°F+). Highly frost sensitive and does not tolerate transplanting.

How to Plant

Plant seeds 1 inch deep.
Indoors: Not recommended due to sensitive taproots.
Outdoors: Sow directly into well-drained soil. Plant 1 seed every 3 inches, then thin to strongest seedlings.
Between plants: 3-4 inches (bush varieties); 6 inches (vining varieties).
Between rows: 24-30 inches.
By square foot: 4-9 plants per square foot.

How Long It Takes

Produces fresh shell peas in 55-65 days; produces dry peas in 80-90 days.

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-95°F. Outstanding heat and drought tolerance; thrives in blistering summer conditions.
Water: 1 inch per week. Very low water needs once established; avoid waterlogging the soil.
Soil pH: 5.5-6.5 (handles poor, sandy, and low-fertility soils exceptionally well).
Common pests: Cowpea curculio, aphids, stink bugs, thrips, root-knot nematodes.

Harvesting

For fresh shell peas, pick pods when they turn their distinct deep purple color but remain plump. For dry peas, leave pods on the vine until they turn dark purple-brown, dry completely, and become brittle.



Storing

Store fresh unshelled green/purple pods in a paper bag in the crisper drawer; use within 3-5 days. Do not refrigerate dry shelled peas.
Long term: Shell fresh peas and freeze immediately in airtight bags for up to a year. Store dry shelled peas in a cool, dark pantry for 1-2 years.

Collecting Seeds

Harvest naturally dried, brittle purple-brown pods from healthy vines. Shell by hand to collect the cream-colored seeds with a distinct purple eye. Freeze for 48 hours to kill weevil larvae, then store in airtight containers with silica gel packs. Seeds last 3-4 years.

Notes

A specialized subspecies of cowpea (Vigna unguiculata). Highly effective nitrogen-fixer that improves poor soils. Excellent heat-tolerant summer cover crop or companion for corn and sorghum. Avoid high-nitrogen fertilizers to prevent excess vine growth at the expense of pods.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Tepary Beans

Pollination: Self
Lifespan: Annual

When to Plant

Direct sow outdoors 2-3 weeks after the last spring frost when soil is fully warm (70-75°F+). Highly frost sensitive and fails in cold, wet soils.

How to Plant

Plant seeds 1 to 1.5 inches deep (deeper than standard beans to access subsoil moisture).
Indoors: Not recommended due to sensitive taproots.
Outdoors: Sow directly into well-draining soil. Plant 1 seed every 3-4 inches; thin to strongest seedlings.
Between plants: 4-6 inches.
Between rows: 24-36 inches.
By square foot: 4-6 plants per square foot.

How Long It Takes

Produces green pods in 50-60 days; produces dry beans in 75-90 days (fast maturing).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 85-105°F. Desert-adapted; thrives in extreme arid heat and drops blossoms if weather is cool or too humid.
Water: 0.5-1 inch per week. Needs very little water; overwatering causes rampant vine growth, root rot, and no pods.
Soil pH: 6.5-8.0
Common pests: Whiteflies, aphids, jackrabbits, root rot (from excess water). Highly resistant to common bean blights.

Harvesting

For dry beans, leave pods on the vine until they turn light tan, paper-dry, and brittle. Harvest promptly before fully dried pods split open and launch their seeds (shattering).



Storing

Do not refrigerate dry beans. Store thoroughly dried shelled beans in an airtight container in a cool, dark, dry pantry. Lasts 1-2 years.
Long term: Store dry shelled beans in sealed mylar bags with oxygen absorbers for 5-10+ years.

Collecting Seeds

Harvest naturally dried, brittle pods before they shatter. Shell the pods by hand to collect the small, flat, highly dense seeds. Freeze seeds for 48 hours to eliminate hidden weevil larvae. Store in airtight containers with silica gel packs. Seeds last 4-5 years.

Notes

Incredible survival crop for drought conditions. Highly effective nitrogen-fixer. Avoid high-nitrogen fertilizers or rich clay soils, which prevent pod formation.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Beets

Pollination: Wind
Lifespan: Biennial



When to Plant

Start seedlings 5-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 3-4 square inches. Thin after sprouting.
Between plants: 3-4 inches.
Between rows: 12-18 inches.
By square foot: 5-9 per square foot.

How Long It Takes

Produces food in 50-70 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 50-75F.
Water: 1-1 1/2 inches per week.
Soil pH: 6.5-7
Common pests: Aphids, spider mites, bean beetles, leafhoppers, stink bugs, thrips, weevils.

Harvesting

Harvest beets when they're 1-2 inches in diameter and barely visible. Gently pull by hand or use a garden fork. Trim leaves back to 1-2 inches, then wash before eating.

Storing

Don't wash. Remove the leaves and store in a cool, humid place in damp sand, sawdust, or peat moss for 3-5 months. You can also boil, peel, and slice them for freezing to last 10-12 months.

Collecting Seeds

Let a plant bolt during the second year. Let the stalks turn brown and brittle. Collect seeds in the late summer by cutting stalks and hanging them to dry 1-2 weeks. Strip seed clusters into a bag. Winnow, then store in a cool, dry place.

Notes

Beets do well in cold weather and can tolerate frost. If you start them in fall, you can grow them into winter, especially with cold tunnels and cloths. Avoid fertilizers heavy in nitrogen.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Bok Choy

Pollination: Insect
Lifespan: Annual/Biennial

When to Plant

Start seedlings 4-6 weeks before last frost, or 4-6 weeks before first frost for a fall crop. Plant successions every 2 weeks. In mild climates, you can also plant in early fall for winter harvest. Bolts in high summer heat.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost for spring crops, or late summer for fall crops. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 6-8 inches (for baby bok choy); 10-12 inches (for full-sized varieties).
Between rows: 12-18 inches.
By square foot: 1-4 per square foot depending on the variety size.

How Long It Takes

Produces food in 30-45 days (baby varieties) or 50-60 days (full-sized heads).

Care/Best Growing Conditions

Sun: 4-6 hours (tolerates partial shade, which helps prevent bolting in warm weather).
Temperature: 55-70°F. Can tolerate temporary light freezes if covered.
Water: 1-1.5 inches per week.
Soil pH: 6.0-7.5
Common pests: Flea beetles, cabbage loopers, imported cabbageworms, aphids, slugs, snails.

Harvesting

Harvest baby leaves/heads when they are 3-4 inches long. For full heads, harvest when the base feels firm and compact, cutting the plant off right at the soil line. Alternatively, you can pinch or cut outer leaves first, 1-2 inches above the soil line, and the inner leaves will keep growing.



Storing (Refrigerate)

Don't wash before storing. Store in a perforated bag in a cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Use within 5-7 days.

Long term: Blanch for 2 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Let a plant bolt in warm weather and produce bright yellow flowers. Allow the slender seed pods (siliques) to turn brown, dry, and brittle on the plant. Cut the stalks and dry them indoors in a paper bag for 1-2 weeks. Crush the pods gently to release the small, dark round seeds and sift out the debris. Store seeds in envelopes or glass/metal containers with silica gel packs. Seeds last 4-5 years.

Notes

Bok choy does great in colder temperatures and handles light frost well. Heavy feeder; side-dress with compost or organic high-nitrogen fertilizer once per month until harvest. Likes thick mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Broccoli (Calabrese)

Pollination: Insects
Lifespan: Biennial



When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 17 square inches. Thin after sprouting.
Between plants: 12-20 inches.
Between rows: 12-20 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 60-100 days (2-3 months).

Care/Best Growing Conditions

Sun: 4-6 hours full sun.
Temperature: 60-70F. Can tolerate brief freezes if covered.
Water: 1-2 inches per week.
Soil pH: 6-6.5
Common pests: Caterpillars, aphids, flea beetles, slugs, snails, harlequin bugs, cabbage maggots, whiteflies

Harvesting

Cut stem 6-8 inches below the head. Cut at a slant to help prevent rot and encourage extra shoots. For best results, harvest before noon.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Calabrese includes DeCicco, Green Goliath, and Waltham 29 varieties. DeCicco produces fastest, around 60 days. Waltham 29 does best in cold weather, bred to resist frost. It can tolerate frost and even freezes down to the mid 20s F. All: Heavy feeders. Need plenty of fertilizer/compost. Fertilize again after 4 weeks.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Broccoli (Sprouting)

Pollination: Insects
Lifespan: Annual/Biennial



When to Plant

Start seeds indoors 6-8 weeks before last frost; transplant after 3-4 weeks.
Fall/Overwinter Crop: Start seeds in mid-summer; transplant in late summer. Sprouting varieties are extremely cold-hardy; purple varieties often require winter cold to produce heavy spring yields.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Transfer after 4-5 weeks. Harden off 3-4 days.
Outdoors: Sow directly in early spring or mid-summer. 2-3 seeds every 18 inches; thin to strongest.
Between plants: 18-24 inches (needs more space than heading broccoli due to massive, bushy side branching).
Between rows: 24-36 inches.
By square foot: 1 plant per 2-4 square feet.

How Long It Takes

Produces food in 80-120 days (2-3 months).

Care/Best Growing Conditions

Sun: 4-6 hours full sun.
Temperature: 45-70F. Can tolerate brief freezes if covered.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Caterpillars, aphids, flea beetles, slugs, snails, harlequin bugs, cabbage maggots, whiteflies

Harvesting

Harvest individual small florets with stems when they're 3-6 inches long and buds are tight. Cut every 2-3 days to force continuous side-shoot production over several weeks or months.

Storing (Refrigerate)

Do not wash before storing. Store florets loosely wrapped in a damp paper towel inside a perforated plastic bag in the crisper drawer. Use within 5-7 days.
Long term: Cut into uniform pieces, blanch for 3 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Includes varieties like Purple Sprouting, White Sprouting, Calabrese Sprouting. Takes longer to mature but provides multiple harvests. Especially resistant to cold. It can tolerate frost and even freezes down to the mid 20s F. All: Heavy feeders. Need plenty of fertilizer/compost. Fertilize again after 4 weeks.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Broccoli (Raab)

Pollination: Insects
Lifespan: Annual



When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 17 square inches. Thin after sprouting.
Between plants: 6-8 inches.
Between rows: 12-20 inches.
By square foot: 1-4 per square foot.

How Long It Takes

Produces food in 30-50 days (1-2 months).

Care/Best Growing Conditions

Sun: 4-6 hours full sun.
Temperature: 50-70F. Can tolerate brief freezes if covered.
Water: 1-2 inches per week.
Soil pH: 6-6.5
Common pests: Caterpillars, aphids, flea beetles, slugs, snails, harlequin bugs, cabbage maggots, whiteflies

Harvesting

Harvest when the small, loose flower clusters first appear but are still tightly closed. Cut the stems 6-8 inches down, taking the attached tender leaves and stems. Cut regularly to encourage a second and third flush of smaller side shoots.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 2-3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Includes Broccoli Raab (Rapini), Gai Lan (Chinese Broccoli), and Broccolini hybrids. Cultivated for their tender leaves, stems, and small buds rather than a unified dense crown. Excellent high-speed crop for filling quick gaps in a seasonal garden rotation. Moderate feeder; side-dress with compost or balanced organic nitrogen fertilizer 3 weeks after planting.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Brussels Sprouts

Pollination: Self
Lifespan: Biennial



When to Plant

Start seedlings 4-8 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 17 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 24-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 80-100 days (3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 50-65F
Water: 1-1.5 inches per week.
Soil pH: 6-7.5
Common pests: Cabbage aphids, cabbage worms, flea beetles, harlequin bugs, cutworms, aphids, whiteflies, moth larvae, loopers.

Harvesting

Cut stem 5-6 inches below the head, at an angle. Plants will produce second, smaller heads. After the season, pull their roots up and compost them.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Brussels sprouts do well in cold weather. They can tolerate frost and even freezes down to the 20s. Heavy feeder. Side-dress after transplanting and once per month until harvest. Stake tall plants. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Cabbage



Pollination: Insects/Wind
Lifespan: Biennial

When to Plant

Start seedlings 6-8 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 18-24 square inches. Thin after sprouting.
Between plants: 12-24 inches.
Between rows: 18-30 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 60-100 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 60-65F. Can tolerate brief freezes if covered.
Water: 1 inch per week.
Soil pH: 6-6.8
Common pests: Cabbage aphids, cabbage worms, flea beetles, harlequin bugs, cutworms, aphids, whiteflies, moth larvae, loopers.

Harvesting

Cut stem right below the head. Leave a few outer leaves to encourage secondary heads.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: shred and blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Cabbage does well in cold weather. It can tolerate frost and even freezes into the low 20s. Heavy feeder. Benefits from regular side-dressing. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Carrots



Pollination: Insects
Lifespan: Biennial

When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter. Best to direct sow.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days. Be careful with root.
Outdoors: Plant right after last frost. Dense seeds per 12 square inches. Thin after sprouting.
Between plants: 2-3 inches.
Between rows: 12-18 inches.
By square foot: 16 per square foot.

How Long It Takes

Produces food in 50-80 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 60-75F
Water: 1 inch per week.
Soil pH: 6-6.8
Common pests: Carrot rust flies, aphids, wireworms, nematodes, cutworms, carrot weevils, celery worms, flea beetles, whiteflies

Harvesting

Loosen the soil with a garden fork, then pull them up by the greens. Cut the greens off before cooking or storing.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture.
Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the flower heads and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Carrots do well in cold weather. They can tolerate frost and even freezes into the high teens. Not a heavy feeder. Benefits from regular side-dressing. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Chantenay Carrots



Pollination: Insects
Lifespan: Annual/Biennial

When to Plant

Direct sow 2-3 weeks before last spring frost. Plant successions every 2-3 weeks for continuous harvest. Plant late summer for a fall harvest. Carrots don't transplant well.

How to Plant

Plant seeds 1/4 inch deep.
Indoors: Not recommended due to sensitive taproots.
Outdoors: Sow directly into loose soil. Plant 1 seed every inch; thin to strongest seedlings after sprouting. Germination takes 10-14 days; keep soil surface constantly damp.
Between plants: 2-3 inches.
Between rows: 12-18 inches.
By square foot: 16-25 per square foot (highly productive in small spaces).

How Long It Takes

Produces food in 60-80 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (tolerates light shade).
Temperature: 55-75°F. Highly frost tolerant.
Water: 1 inch per week.
Soil pH: 6.0-6.8
Common pests: Carrot rust flies, aphids, wireworms, leafminers, root-knot nematodes.

Harvesting

Harvest when the root shoulders reach 1.5 to 2 inches in diameter at the soil line. Pull gently from the crown or loosen soil with a hand trowel. This variety grows short, blocky, and broad-shouldered, making them easier to pull from heavy soils than long types.

Storing (Refrigerate)

Twist or cut off green tops immediately to 1/2 inch (leaves draw moisture from roots). Brush off loose soil; do not wash. Store in a perforated plastic bag in the crisper drawer with a paper towel. Use within 3-4 weeks.
Long term: Blanch slices for 2 minutes, plunge in ice water, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the flower heads and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

The absolute best carrot variety for heavy, compacted, or clay soils due to its short, conical, blocky shape (typically 4-5 inches long). Moderate feeders; avoid fresh manure or excessive nitrogen, which causes roots to fork, hair, or grow massive tops with tiny roots.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Seminole Carrots



Pollination: Insects
Lifespan: Annual/Biennial

When to Plant

Direct sow 2-3 weeks before last spring frost. In southern or subtropical zones, sow late summer through winter (February-August window) to avoid summer heat waves.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: Not recommended due to delicate taproots.
Outdoors: Sow directly into a finely prepped, rock-free seedbed. Keep soil surface consistently moist during a slow 7-21 day germination period. Thin systematically.
Between plants: 2-3 inches.
Between rows: 12-18 inches.
By square foot: 16-25 plants per square foot.

How Long It Takes

Produces food in 60-80 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 55-75°F. Highly frost resilient.
Water: 1 inch per week. Require consistent, uniform soil moisture.
Soil pH: 6.0-6.8 (prefers deeply loosened sandy loam).
Common pests: Carrot rust fly, weevils, alternaria leaf blight.

Harvesting

Harvest when roots reach full size and shoulders fill out nicely down to a blunt tip. Grasp low at the base of the crown, twist slightly, and pull straight up. If soil is firm, loosen carefully with a garden fork.

Storing (Refrigerate)

Twist or cut off green tops immediately to 1/4 inch. Shake or rub off excess dirt; do not wash before long-term storage. Store in a perforated plastic bag in the crisper drawer (32-40°F) away from ethylene-producing fruits. Use within 3-4 weeks.
Long term: Pack unwashed roots vertically into containers filled with damp sand or sawdust in a cold root cellar for 4-6 months.

Collecting Seeds

Let a plant bolt and produce flowers. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the flower heads and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Carrots do well in cold weather. They can tolerate frost and even freezes into the high teens. Not a heavy feeder. Benefits from regular side-dressing. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Cauliflower

Pollination: Self/Insects
Lifespan: Biennial



When to Plant

Start seedlings 4-7 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 18-24 square inches. Thin after sprouting.
Between plants: 18-24 inches.
Between rows: 24-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 60-80 days (2-3 months).

Care/Best Growing Conditions

Sun: 12 hours as seedlings, then 6-8 hours full sun.
Temperature: 60-65F
Water: 1-2 inches per week.
Soil pH: 6-7
Common pests: Cabbage maggots, slugs, snails, aphids, flea beetles, cabbage worms, loopers

Harvesting

Cut stem right below the head. Leave a few outer leaves to encourage secondary heads.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Does well in cold weather. It can tolerate frost and freezes into the mid 20s. Heavy feeder. Tie outer leaves over head when plant reaches 2-3 inches tall. Keeps them tender.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Collard Greens

Pollination: Insects
Lifespan: Biennial



When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 18 square inches. Thin after sprouting.
Between plants: 18-24 inches.
Between rows: 24-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 40-50 days (1-2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 60-70F
Water: 1-1.5 inches per week.
Soil pH: 6-6.8
Common pests: Caterpillars, aphids, flea beetles, harlequin bugs, cutworms, thrips, whiteflies

Harvesting

Cut large, outer leaves near the base. Cut at a slant to prevent rot, etc.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Does well in cold weather. It can tolerate frost and freezes into the single digits. Heavy feeder. Tie outer leaves over head when plant reaches 2-3 inches tall. Keeps them tender.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Corn

Pollination: Wind
Lifespan: Annual

When to Plant

Start seedlings 2-4 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 2-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 8-12 square inches. Thin after sprouting.
Between plants: 12 inches.
Between rows: 36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 60-100 days (2-3 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 77-90F
Water: 1-2 inches per week
Soil pH: 6-6.8
Common pests: corn rootworm, armyworms, cutworms, chinch bugs, corn leaf aphids, corn borers.

Harvesting

Twist the ear and pull it down to snap off.



Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture.
Long term: blanch for 3 minutes, dry, and freeze for up to a year. For dry storage, dry for 1-2 months on the cob, shell it off the cob, and store in airtight containers for a year or more. Flour (dent) corn can last 10-20 years.

Collecting Seeds

Wait until kernels are hard. Harvest the stalk and hang upside down, indoors for another 1-2 weeks to fully dry. Do this sooner if you're expecting wet or humid weather. Shell the kernels and dry another 1-2 weeks.

Notes

Corn does okay in cold weather and can tolerate light frosts, but not extended freezes. Heavy feeder. Benefits from regular side-dressing. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Cucumber



Pollination: Insects
Lifespan: Annual

When to Plant

Start seedlings 3-4 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-36 inches.
Between rows/trellises: 24-48 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 50-70 days (2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-85F
Water: 1-2 inches per week.
Soil pH: 6-6.5
Common pests: Cucumber beetles, aphids, spider mites, whiteflies, leafminers, squash bugs, caterpillars

Harvesting

Cut the stem about 1 inch above the cap.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a cucumber overripen until it's large and soft. Slice it open and scoop out the seeds. Ferment them 2-3 days, then rinse and dry for a week before storing.

Notes

Cucumber doesn't tolerate frost. Heavy feeder. Benefits from regular side-dressing. Likes mulch.

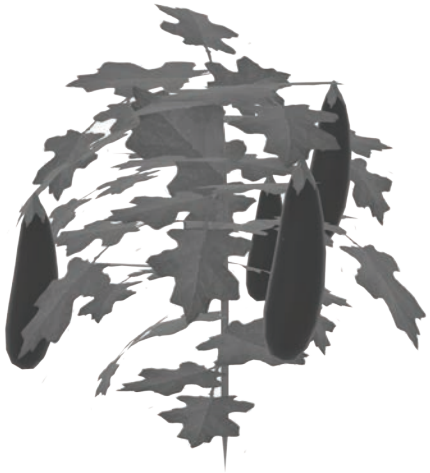
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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Eggplant

Pollination: Insects/Wind
Lifespan: Annual/Perennial



When to Plant

Start seedlings 8-10 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 18 square inches. Thin after sprouting.
Between plants: 18-36 inches.
Between rows: 36-48 inches.
By square foot: 1 per 2 square feet.

How Long It Takes

Produces food in 70-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-90F. Can tolerate warmer weather.
Water: 1-2 inches per week.
Soil pH: 5.8-6.5
Common pests: Aphids, flea beetles, spider mites, hornworms, stink bugs, armyworms, slugs, snails

Harvesting

Cut stem about 1 inch above the cap.

Storing (Don't Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let an eggplant overripen until it's large and soft. Slice it open and scoop out the seeds. Ferment them 2-3 days, then rinse and dry for a week before storing.

Notes

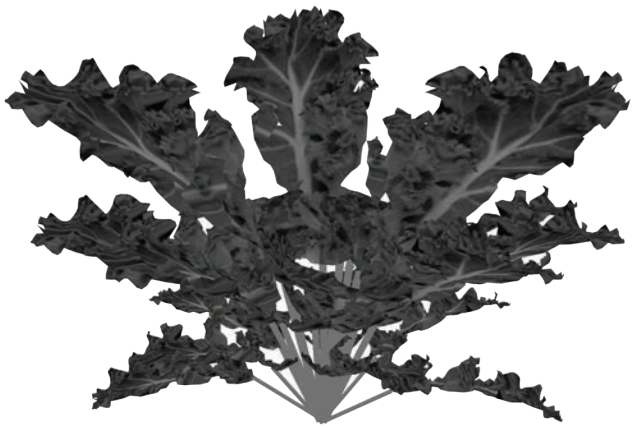
Eggplant doesn't usually survive temperatures below 40F. Heavy feeder. Side-dress after transplanting and once per month until harvest. Stake tall plants. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Kale (General)



Pollination: Insects
Lifespan: Biennial

When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-30 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 55-75 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 50-75F. Can tolerate temporary freezes if covered.
Water: 1-1.5 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Cut large, outer leaves near the base. Cut at a slant to prevent rot, etc.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

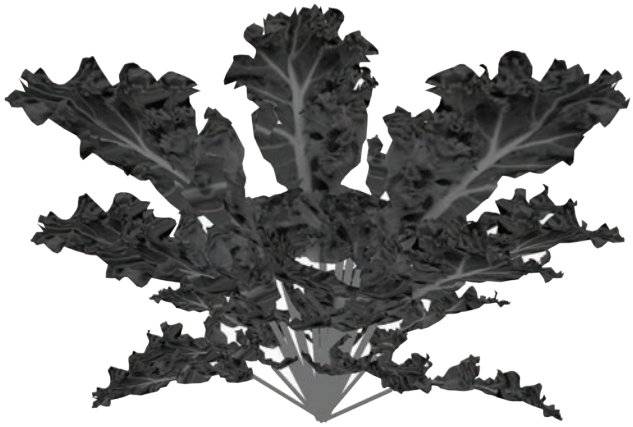
Kale does well in cold weather. It can survive frost and freezes down to the low 20s, even lower. Heavy feeder. Side-dress after transplanting and once per month until harvest. Stake tall plants. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Kale (Scotch)



Pollination: Insects
Lifespan: Biennial

When to Plant

Spring Crop: Start seeds indoors 4-6 weeks before last frost; transplant 3-4 weeks before last frost. Fall/Winter Crop: Direct sow or transplant in mid-to-late summer.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Transfer after 4 weeks. Harden off 3-4 days.
Outdoors: Sow directly in early spring or mid-summer. 2-3 seeds every 12 inches; thin to strongest.
Between plants: 12-18 inches (forms dense, compact, bushy rosettes).
Between rows: 18-24 inches.
By square foot: 1 plant per square foot.

How Long It Takes

Produces food in 25-30 days (baby greens) or 50-60 days (mature curly heads).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (tolerates partial shade well).
Temperature: 45-70°F. The most cold-hardy kale type; tightly crinkled leaves trap air to survive deep freezes down to 0-5°F without protection.
Water: 1-1.5 inches per week. Needs consistent moisture to keep heavy curls tender.
Soil pH: 6.5-7.5 (prefers rich, firm loam).
Common pests: Cabbage worms, cabbage loopers, aphids (can hide deeply in curly leaves), flea beetles, slugs.

Harvesting

Pinch or cut individual outer leaves at the base of the stem when they reach the size of your hand. Leave the central growing crown untouched to continuously produce new leaves from the inside out all winter.

Storing (Refrigerate)

Do not wash before storing. Wrap leaves loosely in a damp paper towel and place inside a perforated bag in the crisper drawer. Rigid curly structure holds up exceptionally well. Use within 7-10 days.
Long term: Remove tough woody stems, blanch leaves for 2 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Must overwinter in the ground. In spring, it sends up a tall stalk with yellow flowers. Isolate from other Brassica oleracea (broccoli, cabbage, kohlrabi) by 1/2 mile. Allow seed pods to turn tan and brittle. Cut stalks into a paper bag to dry for 2 weeks, then crush pods and winnow chaff. Store in airtight containers with silica-packs. Seeds last 4-5 years.

Notes

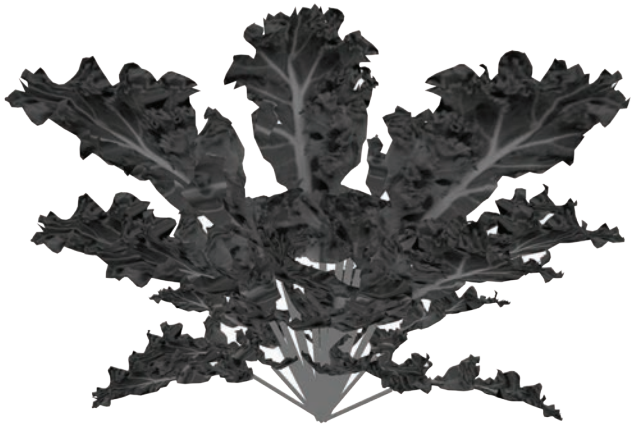
Includes varieties like Vates, Westland Winter, and Dwarf Green Curled. Exceptional small-space, high-yield survival crop. Heavy feeder; amend soil heavily with rich compost or high-nitrogen organic fertilizer at planting and side-dress every 4-6 weeks.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Kale (Dinosaur)



Pollination: Insects
Lifespan: Biennial

When to Plant

Spring Crop: Start seeds indoors 4-6 weeks before last frost; transplant 3-4 weeks before last frost. Fall/Winter Crop: Direct sow or transplant in mid-to-late summer. Highly adaptable; handles summer heat better than curly kales.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Transfer after 4 weeks. Harden off 3-4 days.
Outdoors: Sow directly in early spring or mid-summer. 2-3 seeds every 12-15 inches; thin to strongest.
Between plants: 12-18 inches (upright, tree-like growth structure).
Between rows: 18-24 inches.
By square foot: 1 plant per square foot.

How Long It Takes

Produces food in 25-30 days (baby greens) or 50-65 days (mature strap leaves).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (tolerates partial shade).
Temperature: 45-80°F. Outstanding heat tolerance; less prone to summer bolting but suffers leaf damage in deep winter freezes below 10-15°F without protection.
Water: 1-1.5 inches per week. Requires deep, consistent moisture to prevent leaves from becoming tough.
Soil pH: 6.5-7.5
Common pests: Cabbage worms, aphids (easier to wash off flat leaves), flea beetles, harlequin bugs.

Harvesting

Pinch or cut individual mature outer leaves from the bottom of the stem upward. Leaves should be 10-12 inches long. Leave the top central crown intact to maintain a tree-like growth habit that continually yields new leaves.

Storing (Refrigerate)

Do not wash. Wrap leaves loosely in a damp paper towel inside a perforated bag in the crisper drawer. Flat, dimpled leaves pack flat and store easily. Use within 5-7 days.
Long term: De-stem, blanch leaves for 2 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Includes Nero di Toscana, Black Magic, and Tuscan Lacinato. Striking blue-green, heavily dimpled (savoyed) strap leaves. Excellent choice for tight, narrow layout configurations due to its strictly upright vertical growth habit. Heavy feeder; amend soil with rich compost or a high-nitrogen organic fertilizer at planting and side-dress monthly.

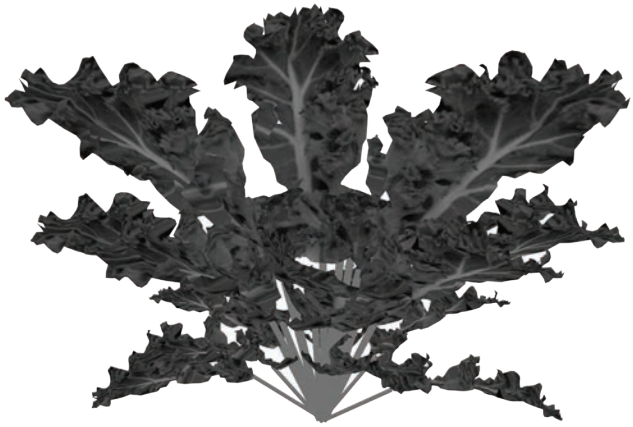
Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Kale (Russian)

Pollination: Insects
Lifespan: Biennial



When to Plant

Spring Crop: Start indoors 4-6 weeks before last frost; transplant 3-4 weeks before last frost. Or direct sow after last frost. Fall Crop: Direct sow or transplant in mid-to-late summer. Extremely fast-growing crop.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Transfer after 4 weeks. Harden off 3-4 days.
Outdoors: Sow directly in early spring or mid-summer. 2-3 seeds every 12 inches; thin to strongest.
Between plants: 12-16 inches (forms broad, sprawling, oak-like leaf rosettes).
Between rows: 18-24 inches.
By square foot: 1 plant per square foot.

How Long It Takes

Produces food in 20-25 days (baby greens) or 50-55 days (mature flat leaves).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (highly tolerant of partial shade).
Temperature: 40-75°F. Highly winter-hardy down to 10°F (-12.2°C). Outstanding drought tolerance compared to other kales.
Water: 1 inch per week.
Soil pH: 6.0-7.5
Common pests: Cabbage worms, aphids, flea beetles, slugs.

Harvesting

Cut individual mature outer leaves at the stem base when they reach 8-10 inches long. Leave the central crown intact for continuous, multi-month production.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. It will then form seed pods. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the pods and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Includes Red Russian, White Russian, and Siberian varieties. Faster growing and more tender to eat raw than curly or dinosaur kales. Moderate-to-heavy feeder; amend soil with compost and side-dress with nitrogen-rich organic fertilizer mid-season.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
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70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Kohlrabi

Pollination: Insect
Lifespan: Annual/Biennial



When to Plant

Start seedlings 4-6 weeks before last frost, or 4-6 weeks before first frost for a fall crop. Plant successions every 2-3 weeks. Grows best in cool weather and will quickly become woody, tough, and bitter if grown in high summer heat.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Transfer after 4-5 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost for spring crops, or mid-to-late summer for fall crops. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 6-8 inches apart.
Between rows: 12-18 inches.
By square foot: 1-4 per square foot depending on the variety and target harvest size.

How Long It Takes

Produces food in 45-60 days (2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (can tolerate partial shade in warmer climates).
Temperature: 55-75°F. Highly frost tolerant; temporary freezes improve the flavor.
Water: 1-1.5 inches per week.
Soil pH: 6.0-7.5
Common pests: Cabbage worms, cabbage loopers, flea beetles, aphids, root maggots, thrips.

Harvesting

Harvest stems when 2-3 inches in diameter. Cut the stem at the soil line, below the bulb. Young, tender leaves can also be harvested sparingly throughout the season to eat like kale.

Storing (Refrigerate)

Cut off the leaves and stems from the bulb, leaving about an inch of stem attached. Don't wash. Store bulbs in a perforated bag in a cool, humid place away from ethylene-producing fruits (apples, avocados, tomatoes). Store leaves separately in a damp paper towel. Bulbs last 2-3 weeks; leaves use within 3-5 days.
Long term: Peel the skin, dice or slice the bulb, blanch for 3 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Allow the long seed pods to turn tan, dry, and brittle on the stalk. Cut the stalks and dry them indoors in a paper bag for 1-2 weeks. Crush pods by hand to release seeds and sift out the chaff. Store seeds in envelopes or airtight glass/metal containers with silica gel packs. Seeds last 4-5 years.

Notes

Kohlrabi loves cold temperatures. Heavy feeder. Side-dress with compost or fertilizer. Loves mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
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1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Onion

Pollination: Insects
Lifespan: Biennial

When to Plant

Start seedlings 2-4 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 3/4 - 1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 5-9 seeds per 12 square inches. Thin after sprouting.
Between plants: 3-4 inches.
Between rows: 12-15 inches.
By square foot: 5-9 per square foot.

How Long It Takes

Produces food in 90-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 55-75F. Can tolerate temporary freezes if covered.
Water: 1-1.5 inches per week.
Soil pH: 6-6.8
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest onions when about half the top stems start to turn/flop over. Lift the bulbs out with a garden fork when it's dry.



Storing (Don't Refrigerate)

Don't wash. Store in a perforated bag in cool, dry place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Also store away from potatoes. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the flower heads and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Onions handle cold better than most plants. You can even start them earlier and transplant before the last frost date, as long as the soil is workable and temperatures stay around 50F.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Okra

Pollination: Self/Insect
Lifespan: Annual



When to Plant

Start seeds 4-6 weeks before last frost. Plant successions through early summer. Requires warm soil to germinate and will not survive frost.

How to Plant

Plant seeds 1/2 to 1 inch deep.
Indoors: 2-3 seeds per plug. Thin after sprouting. Transfer after 4-6 weeks. Harden off for 3-4 days. Sensitive roots; transplant carefully.
Outdoors: Plant 2-3 weeks after last frost when soil is warm. 2-3 seeds per 12 inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 24-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 50-65 days (2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-90°F. Extremely heat and drought tolerant; highly frost sensitive.
Water: 1 inch per week.
Soil pH: 6.0-7.5
Common pests: Aphids, stink bugs, corn earworms, flea beetles, root-knot nematodes.

Harvesting

Harvest pods when they are 2-3 inches long and tender. Cut stems with shears. Harvest every 2-3 days to encourage continuous production. Wear long sleeves to avoid skin irritation from pod hairs.

Storing (Refrigerate)

Don't wash before storing. Store in a perforated bag in a cool, humid place away from ethylene producers. Add a paper towel to absorb moisture. Use within 2-3 days.
Long term: Wash, trim stems, blanch whole pods for 3-4 minutes, plunge in ice water, dry completely, slice, and freeze for up to a year.

Collecting Seeds

Let pods mature, turn brown, and crack open on the stalk. Cut pods and dry indoors in a paper bag for 1-2 weeks. Split pods to release the large, dark round seeds. Store seeds in envelopes or airtight glass/metal containers with silica gel packs. Seeds last 2-3 years.

Notes

Okra thrives in intense summer heat when other crops wither. It's a heavy feeder; side-dress with compost or balanced organic fertilizer 4 weeks after transplanting and mid-season. Thrives in most soils if well-drained.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Parsnips

Pollination: Insect
Lifespan: Annual/Biennial



When to Plant

Direct sow 2-3 weeks before last spring frost when soil is workable. Seeds require cool soil to germinate. Direct sow best. Can plant in late summer if you have a mild winter.

How to Plant

Plant seeds 1/4 to 1/2 inch deep.
Indoors: Not recommended due to sensitive taproots.
Outdoors: Sow directly into deeply loosened, rock-free soil. 2-3 seeds every 3 inches. Thin to strongest seedling after sprouting. Germination is notoriously slow (up to 3 weeks).
Between plants: 3-4 inches.
Between rows: 12-18 inches.
By square foot: 4-9 per square foot.

How Long It Takes

Produces food in 100-120 days (4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (tolerates light shade).
Temperature: 45-75°F. Highly frost tolerant; flavor sweetens drastically after a hard freeze.
Water: 1 inch per week. Requires consistent, deep moisture to prevent woody or split roots.
Soil pH: 6.0-6.8.
Common pests: Carrot rust flies, parsley worms, aphids, leafminers, root-knot nematodes.

Harvesting

Harvest roots after 1-2 hard frosts have converted starches to sugars. Carefully loosen soil with a spading fork and lift the roots from the crown to avoid snapping the taproot. Wear gloves; wild/mature parsnip foliage sap causes skin irritation in sunlight.

Storing (Refrigerate)

Don't wash. Cut foliage down to 1/2 inch. Store in a perforated bag in the crisper drawer with a paper towel. Use within 2-3 weeks.
Long term: Peel, slice, blanch for 2 minutes, plunge in ice water, dry, and freeze for up to a year.

Collecting Seeds

Let a root overwinter in the ground. The following spring, it will produce umbels of yellow flowers. Allow seed heads to turn tan, dry, and flat on the plant. Cut the stems into a paper bag to dry for 2 weeks. Shake loose the flat, papery seeds. Store in airtight containers with silica packs. Seeds last 1 year.

Notes

Parsnips require patience due to sluggish germination and a long growing season. Moderate feeders. Avoid heavy nitrogen fertilizer.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Peppers (Bell)

Pollination: Self
Lifespan: Perennial



When to Plant

Start seedlings 8-10 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/4-1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 8-10 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 18-24 inches.
Between rows: 30-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 60-90 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 65-80F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Pinch or cut them in the morning or cut them with shears, leaving a small bit of stem. Start harvesting them as soon as they reach 3-4 inches. Earlier harvesting boosts production.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Pick fully ripe peppers. Cut them open and scoop out the seeds. Dry them for 4-7 days before storing.

Notes

Bell peppers don't do very well in cold and stop growing when temperatures hit 55F and below. Even a light frost can kill them.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Peppers (Chili)

Pollination: Self
Lifespan: Perennial



When to Plant

Start seedlings 8-10 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 8-10 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-30 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 70-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-80F.
Water: 1-1.5 inches per week.
Soil pH: 6-6.8
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

You can harvest them when they're 2-3 inches in length, even when green. Let them turn red for full flavor, and harvest 3-5 days after the color turn. Twist or cut 1-2 inches above the cap. Cutting is better (less damage).

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Pick fully ripe peppers. Cut them open and scoop out the seeds. Dry them for 1-2 weeks before storing.

Notes

Chili peppers are perennial, but they don't do well in cold and frost can kill them. Heavy feeder. Side-dress after transplanting and once per month until harvest. Stake tall plants. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Potatoes (Standard)

Pollination: Self
Lifespan: Annual



When to Plant

Start True Potato Seeds (TPS) indoors 6-8 weeks before the last spring frost. TPS requires a head start indoors because seedlings grow much more slowly than plants started from clones/tubers. Highly sensitive to frost.

How to Plant

Plant seeds 1/8 inch deep in a fine, lightweight seed-starting mix.
Indoors: 2-3 seeds per plug. Thin to the strongest sprout after germination (takes 7-14 days). Provide strong overhead grow lights to prevent leggy growth.
Outdoors: Transplant seedlings outdoors 2-3 weeks after last frost and plants are 4-6 inches tall.
Between plants: 12 inches.
Between rows: 24-36 inches.
By square foot: 1 plant per square foot.

How Long It Takes

Produces food in 100-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 60-75°F for seedling growth.
Water: 1-1.5 inches per week.
Soil pH: 4.8-6
Common pests: Aphids, flea beetles, fungus gnats (indoors), Colorado potato beetles.

Harvesting

Dig the roots carefully in autumn 2 weeks after the foliage completely dies back and turns brown. Because TPS plants are genetically unique, the harvest will yield a surprise mix of shapes, colors, and sizes, mostly consisting of small "mini-tubers."

Storing

Never refrigerate raw potatoes. Brush off loose soil; do not wash. Store these small mini-tubers in a dark, humid, cool pantry or root cellar (45-50°F) in breathable mesh bags or crates. Sawdust or chopped straw helps. Lasts 4-6 months.

Long term: Store these mini-tubers safely over winter to use as your elite, virus-free "seed potatoes" for the following spring's main crop.

Collecting Seeds

Let the plants flower and produce small, green, tomato-like seed balls (berries). Warning: Berries are highly toxic and inedible. Let berries soften on the vine, mash them in water, strain out the tiny seeds, and dry them thoroughly on parchment paper for 2 weeks. Store in airtight containers with silica gel packs. Seeds last 4-6 years.

Notes

Standard varieties include Russet, Yukon Gold, and Red Norland. True Potato Seed (TPS) refers to botanical seeds collected from the potato fruit. TPS is an elite survival strategy: botanical seeds don't carry over soil-borne viruses that build up in cloned seed potatoes over generations. Every seed produces a completely new, unique variety.

Conversions

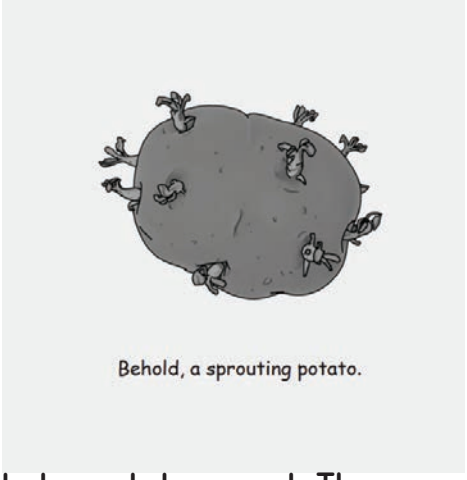
1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
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0 Degrees F = -17.8C
32 Degrees F = 0C
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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

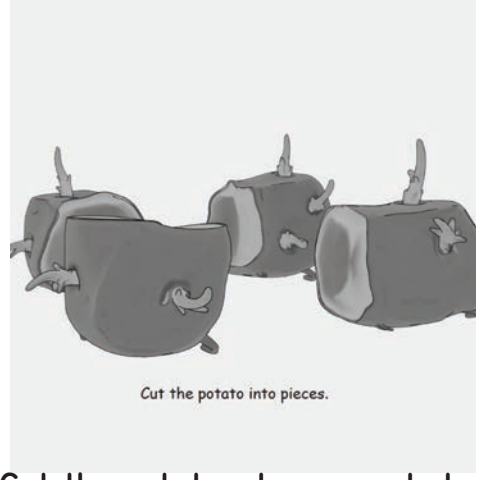
Hilling Potatoes



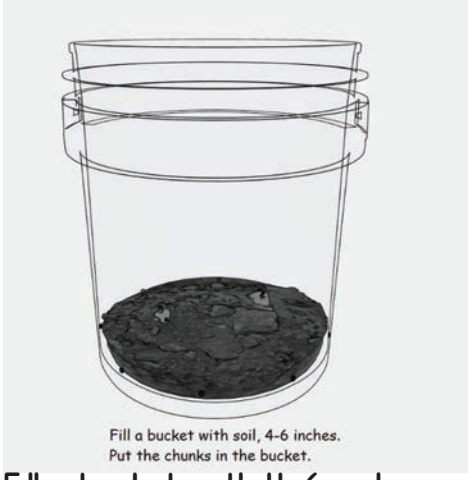
You don't have to start potatoes from seed. You can grow them within 12 weeks using almost any sprouting potato from the store. You can also hill them to increase your yield, more potatoes in less space. It's best to get organic potatoes, because they haven't been treated with anything that would interfere with them sprouting. All you need is the potatoes, grow bags or buckets with drainage holes drilled in the bottom, and a little patience.



Let a potato sprout. They should run about 1/2 inch.



Cut the potato into pieces. Let them harden for 1-2 days.



Fill a bucket with 4-6 inches of soil, sprouts facing up.



Let them grow 4-6 weeks. Cover them with soil, leaving 2-3 inches exposed.



Repeat a few weeks later. Around week 11, let them wilt.



At week 12-13, the plant will brown. Dump the bucket. Dig out the potatoes.

Scallions

Pollination: Self
Lifespan: Annual



When to Plant

Direct sow in early spring as soon as soil can be worked (2-4 weeks before last frost). Plant successions every 2-3 weeks through summer for continual harvest, or sow in late summer for fall and overwintered spring harvests.

How to Plant

Plant seeds 1/4-1/2 inch deep.
Indoors: Start 6-8 weeks before last frost. Sow 6-8 seeds per plug (multi-sowing). Keep soil moist until germination (7-14 days). Harden off for 3-4 days before transplanting.
Outdoors: Sow densely in 2-3 inch wide bands (no thinning required for pencil-thin stalks) or space 1 inch apart.
Between plants: 1-2 inches (or 6 inches between multi-sown clusters).
Between rows: 12-18 inches.
By square foot: 16 per square foot.

How Long It Takes

Produces food in 60-65 days (2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 55-80°F optimal. Frost-tolerant; hardy varieties survive winter freezes down to 10-20°F.
Water: 1-1.5 inches per week.
Soil pH: 6.0-7.0.
Common pests: Onion thrips, onion maggots, aphids, slugs, cutworms.

Harvesting

Harvest anytime once stalks reach pencil thickness (about 6-8 inches tall). Cut green tops 1-2 inches above the soil line so plants regrow, or loosen the soil and pull the entire plant.

Storing

Don't wash until ready to use. Wrap unwashed scallions in a slightly damp paper towel inside a perforated plastic bag in the crisper drawer for 1-2 weeks. (Alternatively, stand roots upright in a jar with 1 inch of water on a sunny windowsill for continuous fresh shoots). Long term: Wash, dry thoroughly, slice, and freeze flat on a baking sheet before transferring to a freezer bag for up to 6-12 months (no blanching needed).

Collecting Seeds

Let seed heads dry and turn brown on the stalk until black seeds become visible inside papery pods. Cut heads, dry indoors for 1-2 weeks, and shake or rub to release seeds. Store in a cool, dry airtight container. Seeds remain viable for 1-2 years.

Notes

Shallow roots compete poorly with weeds, so keep beds well-weeded and mulched. Hill soil up around the base of stems a few weeks before harvest to blanch and lengthen the tender white shanks. Great companion plant for carrots, beets, and brassicas to help deter pests.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Seminole Pumpkin

Pollination: Insect
Lifespan: Annual



When to Plant

Start seedlings indoors 3 weeks before the last frost date. For direct outdoor sowing, plant seeds only after the soil has warmed to at least 70°F and all threats of frost have passed.

How to Plant

Plant seeds 1 inch deep.
Indoors: 1-2 seeds per cell. Handle fragile roots with care when transplanting. Harden off for 7 days.
Outdoors: Sow 3-4 seeds per hill, then thin down to the strongest single vine once seedlings develop their first set of true adult leaves.
Between plants: 3-4 feet.
Between rows: 4-6 feet.
By square foot: 1 per 16 square feet (requires immense sprawling room or a sturdy overhead arbor/trellis system).

How Long It Takes

Produces food in 90-110 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun minimum.
Temperature: 75-95°F. Thrives in extreme heat, high humidity, and tropical downpours.
Water: 1-1.5 inches per week.
Soil pH: 5.5-6.8.
Common pests: Squash bugs, pickleworms. Highly resistant to squash vine borers, powdery mildew, and downy mildew.

Harvesting

Harvest in late summer or autumn before the first frost. The tear-drop or round pumpkins will change from dull green to a uniform dull tan-orange color. Cut the vine leaving 2-3 inches of stem attached to the fruit.

Storing

Do not wash. Cure in a warm, dry area for 7-10 days. Once cured, store them raw in a cool, dark room or pantry (55-60°F). Because of their incredibly thick rinds, they can keep flawlessly without refrigeration for 6 to 12 months.

Collecting Seeds

Allow a well-formed pumpkin to remain on the vine until the plant completely dies back in the fall. Slice open the hard rind and scoop out the seeds. Wash away the pulp in a colander, discard any light seeds that float, and dry the heavy seeds flat on screen trays for 2 weeks. Seeds last 3-5 years.

Notes

It is arguably the most bulletproof survival crop for hot, humid, or swampy climates where other squashes instantly rot or get eaten by pests. The young leaves, flowers, and mature flesh are all edible.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Spinach

Pollination: Wind
Lifespan: Annual



When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest. You can also plant in early fall for harvest in winter.

How to Plant

Plant seeds 1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 2-4 inches.
Between rows: 12-18 inches.
By square foot: 6-9 per square foot.

How Long It Takes

Produces food in 40-50 days (2 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 50-60F. Can tolerate temporary freezes if covered.
Water: 1-1.5 inches per week.
Soil pH: 6.5-7
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest leaves when they're 3-4 inches long. Pinch or cut outer leaves first, 2-3 inches above the soil line. The inner leaves will keep growing.

Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Let a plant bolt and produce flowers. Let them turn brittle. If you expect wet or humid weather, cut the stalks and dry them indoors for 1-2 weeks. Crush the flower heads and sift out the seeds. Dry the seeds 2-3 more days, then store them in envelopes or glass/metal containers with silica gel packs. Seeds last 3-5 years.

Notes

Spinach does fine in colder temperatures, even as low as 15-20F. It's a heavy feeder. Side-dress after transplanting and once per month until last harvest. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Spinach (Malabar)

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Start seeds indoors 6-8 weeks before last frost, or direct sow after all frost danger has passed and soil is warm. Thrives in intense summer heat and will not survive frost.

How to Plant

Plant seeds 1/4 to 1/2 inch deep. Scarify (nick) or soak seeds overnight to speed up slow germination.
Indoors: 1-2 seeds per plug. Thin to strongest. Transfer after 6-8 weeks. Harden off for 3-4 days.
Outdoors: Plant after soil warms to 70°F+. 2-3 seeds every 6 inches; thin to strongest.
Between plants: 6 inches (if trellised); 12 inches (if allowed to sprawl).
Between rows: 24-36 inches.
By square foot: 1-2 per square foot (trellised).

How Long It Takes

Produces food in 50-70 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun (tolerates light afternoon shade).
Temperature: 80-95°F.
Water: 1-1.5 inches per week.
Soil pH: 6.0-6.7
Common pests: Nematodes, slugs, snails, leaf miners (generally highly pest-resistant).

Harvesting

Cut tender young leaves and top 6-inch stems/tips regularly once the vine reaches 1-2 feet tall. Frequent harvesting encourages branching and dense, bushy growth.



Storing (Refrigerate)

Don't wash. Store leaves in a perforated bag in the crisper drawer with a paper towel. Use within 4-7 days.
Long term: Blanch for 2 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Let berries mature from green to dark purple/black on the vine. Pick and crush berries in water to separate the seeds from pulp. Dry seeds thoroughly on parchment paper for 2-3 weeks. Store in airtight containers with silica gel packs. Seeds last 3-4 years.

Notes

Not a true spinach. A climbing vine that requires a trellis, fence, or tripod. Heavy feeder; amend soil with compost or high-nitrogen organic fertilizer at planting and side-dress monthly.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Sorghum

Pollination: Self/Wind
Lifespan: Annual

When to Plant

Direct sow 2 weeks after last spring frost when soil is warm (65°F+). Highly sensitive to frost. Does not transplant well; indoor starting is rarely recommended.

How to Plant

Plant seeds 1/2 to 1 inch deep.
Indoors: Not recommended due to sensitive roots. If necessary, use biodegradable pots 3 weeks before last frost.
Outdoors: Sow directly after soil warms.
2-3 seeds every 4 inches; thin to strongest.
Between plants: 4-6 inches (grain/sweet); 8-12 inches (broomcorn).
Between rows: 24-36 inches.
By square foot: 1-2 per square foot.

How Long It Takes

Produces food in 90-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-95°F. Highly drought and heat tolerant; goes dormant in extreme drought and revives with rain.
Water: 1 inch per week. Extremely efficient water user once established.
Soil pH: 5.5-7.5
Common pests: Aphids (sugar cane aphid), armyworms, corn earworms, birds (at seed stage).

Harvesting

For syrup: Harvest stalks when seeds reach the milk/dough stage; strip leaves, cut stalks at base, and crush for juice. For grain/broomcorn: Harvest seed heads late autumn when grain is hard and cannot be dented with a fingernail.



Storing

Do not refrigerate raw stalks or grain. Store pressed syrup in airtight jars in a cool pantry for years.
Long term: Store dried grain seeds whole in airtight containers in a cool, dark pantry for 2-3 years. Flour should be frozen to extend shelf life.

Collecting Seeds

Let seed heads mature and harden fully on the stalk in autumn. Cut heads and dry indoors in a paper bag for 2 weeks. Thresh by rubbing heads over a bucket, then winnow to remove chaff. Store in airtight containers with silica gel packs. Seeds last 3-4 years.

Notes

Towering crop (6-12 feet) that looks like corn but handles heat and poor soil much better. Excellent vertical windbreak or backdrop. Warning: Stressed or frost-damaged young plants can produce prussic acid, which is highly toxic to livestock.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Squash (Yellow)

Pollination: Insects
Lifespan: Annual

When to Plant

Start seedlings 3-4 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/2- 1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 24 square inches. Thin after sprouting.
Between plants: 24-36 inches.
Between rows: 48-56 inches.
By square foot: 1 per 2-3 square foot.

How Long It Takes

Produces food in 40-60 days (2-3 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-1.5 inches per week.
Soil pH: 6-6.8
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Start harvesting squash when they're 4-8 inches long to encourage more production. Pinch or cut above the cap, leaving a bit of stem.



Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Pick a fully ripe squash. Cut it open and scoop out the seeds. Dry them for 3-4 days. You can also ferment them first. Make sure they're completely dry before storing.

Notes

Heavy feeder. Side-dress after transplanting and once per month until harvest. Stake or trellis vining varieties. Likes mulch.

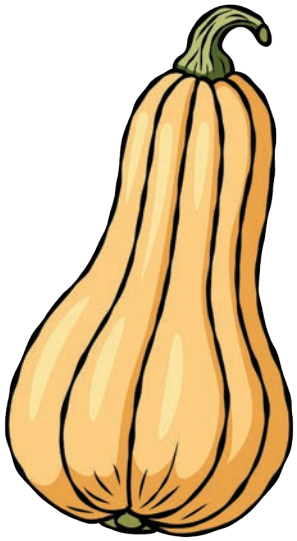
Conversions

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70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Squash (Butternut)

Pollination: Insects
Lifespan: Annual



When to Plant

Start seedlings indoors 3-4 weeks before the last frost. For direct sowing outdoors, plant only after the soil has warmed completely and all danger of spring frost has passed.

How to Plant

Plant seeds 1 inch deep.
Indoors: 1-2 seeds per pot or plug cell. Transplant carefully after 3-4 weeks to avoid root shock. Harden off for 1 week before moving outdoors.
Outdoors: Plant right after last frost. Sow 2-3 seeds per hill or mound, spaced 3-4 feet apart. Thin to the strongest seedling per hill after sprouting.
Between plants: 36-48 inches.
Between rows: 4-6 feet.
By square foot: 1 per 9-16 square feet (best grown vertically on a sturdy trellis for space efficiency).

How Long It Takes

Produces food in 95-110 days (3.5 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun minimum.
Temperature: 70-90°F. Sensitive to cold; will wilt or die in frost.
Water: 1-1.5 inches per week.
Soil pH: 6.0-6.8.
Common pests: Squash bugs, cucumber beetles, squash vine borers, aphids. Highly susceptible to powdery mildew in high humidity.

Harvesting

Harvest in late summer or fall before the first hard freeze. Look for a uniform tan-beige rind with no green streaks, and a woody, dry stem. Cut the stem leaving 2 inches attached; do not pull.

Storing

Do not wash. Cure in a warm, dry area (80-85°F) for 10 days to harden the skin. Once cured, store raw in a cool, dry pantry (50-55°F) away from apples or pears. Keeps well for 3-6 months without refrigeration.

Collecting Seeds

Allow to mature on the vine until the rind is rock hard and the vine dies back. Scoop the seeds from the central cavity. Rinse in water to remove pulp, discard any seeds that float, and dry flat on a screen for 2-3 weeks. Store in an airtight container with silica gel. Seeds last 3-5 years.

Notes

Butternut squash requires massive space to vine out unless systematically trained upward on heavy livestock/cattle panels. It is a heavy feeder; top-dress with compost mid-season. If fruit drops early or fails to form, hand-pollinate using a male flower paintbrush technique.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Squash (Acorn)

Pollination: Insects
Lifespan: Annual



When to Plant

Start seedlings indoors 3-4 weeks before the last frost. For direct outdoor sowing, wait until the soil warms to at least 70°F and all danger of spring frost has completely passed.

How to Plant

Plant seeds 1 inch deep.
Indoors: 1-2 seeds per plug cell. Handle roots with extreme care during transplanting to prevent transplant shock. Harden off for 5-7 days.
Outdoors: Plant immediately after the last frost. Sow 2-3 seeds per hill, then thin down to the single strongest sprout once they reach 2-3 inches tall.
Between plants: 24-36 inches.
Between rows: 4-6 feet.
By square foot: 1 per 9 square feet (bush varieties take less space; vining varieties can be grown vertically on a sturdy trellis).

How Long It Takes

Produces food in 80-90 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-90°F. Thrives in warm weather; highly susceptible to frost damage.
Water: 1-1.5 inches per week. Water deeply at the base; keep leaves dry to prevent fungal issues.
Soil pH: 6.0-6.8
Common pests: Squash bugs, vine borers, cucumber beetles, powdery mildew.

Harvesting

Harvest in early fall before the first heavy frost. The skin should turn a dark, dull green with an orange patch where it rested on the ground, and the rind must be hard enough to resist a fingernail puncture. Cut the stem leaving 1-2 inches.

Storing

Do not wash. Unlike other winter squashes, do not cure acorn squash at high temperatures, as it shortens their shelf life. Store immediately in a cool, dry pantry (50-55°F). Keeps well for 5-8 weeks; quality degrades after 2 months.

Collecting Seeds

Scrape seeds from mature fruit, wash off pulp, and dry on parchment paper indoors for 2-3 weeks. Store in airtight containers with silica gel packs. Seeds last 4-5 years.

Notes

Acorn squash grows faster than butternut but does not store nearly as long. It is a heavy feeder that benefits from a mid-season compost side-dressing. If the first flowers drop without setting fruit, hand-pollinate with a cotton swab in the early morning.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Squash (Cushaw)

Pollination: Insects
Lifespan: Annual



When to Plant

Start seedlings 3-4 weeks before last frost or direct sow after all frost danger passes and soil is completely warm (70°F+). Highly sensitive to frost.

How to Plant

Plant seeds 1 inch deep.
Indoors: 1-2 seeds per biodegradable pot. Transfer after 3 weeks. Harden off 3-4 days. Sensitive roots.
Outdoors: Sow in rich hills after soil warms. 3-4 seeds per hill; thin to the 2 strongest vines.
Between plants: 3-4 feet (space hills 5-6 feet apart).
Between rows: 6-8 feet.
By square foot: 1 plant per 12-15 square feet (massive, sprawling vines).

How Long It Takes

Produces food in 95-105 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-95°F.
Water: 1-1.5 inches per week.
Soil pH: 6.0-7.0
Common pests: Squash bugs, cucumber beetles, vine borers (notably resistant to vine borers due to thick stems).

Harvesting

Harvest in autumn when the vine dies back, the skin turns a dull cream color (often with green stripes), and the rind is too hard to dent with a fingernail. Cut stem leaving 3-4 inches attached. Harvest before frost.

Storing (Refrigerate)

Do not refrigerate whole fruit. Cure in a warm, dry room for 10-14 days, then store unwashed in a cool, dark pantry (50-55°F). Lasts 3-5 months.
Long term: Cook flesh, purée or cube, and freeze for up to a year.

Collecting Seeds

Scrape seeds from mature fruit, wash off pulp, and dry on parchment paper indoors for 2-3 weeks. Store in airtight containers with silica gel packs. Seeds last 4-5 years.

Notes

A highly resilient, ancient heirloom winter squash (Cucurbita mixta). Massive vines require extensive room to run and can easily overtake neighboring plants if not managed. Heavy feeder; amend soil heavily with compost or manure at planting and side-dress when vines begin to run.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Swiss Chard

Pollination: Wind
Lifespan: Annual/Biennial



When to Plant

Sow seeds outdoors 2-3 weeks before the last spring frost, or start indoors 4-5 weeks prior. Plant successions through mid-summer for continuous fall harvests. Handles mild winter temperatures and can be planted in early fall in mild zones.

How to Plant

Plant seeds 1/2 inch deep. Each seed is a cluster that produces multiple sprouts.
Indoors: 1 seed cluster per plug. Transfer after 4-5 weeks. Harden off for 3-4 days.
Outdoors: Plant in workable spring soil. 1 cluster every 3 inches; thin to strongest sprout after germination.
Between plants: 6-12 inches (wider spacing yields larger stalks).
Between rows: 12-18 inches.
By square foot: 1-4 per square foot depending on target harvest size.

How Long It Takes

Produces food in 50-60 days (full leaves).

Care/Best Growing Conditions

Sun: 4-6 hours (prefers full sun but tolerates partial shade well).
Temperature: 50-85°F.
Water: 1-1.5 inches per week. Needs consistent moisture for thick stalks.
Soil pH: 6.0-7.0
Common pests: Leaf miners, aphids, flea beetles, slugs, cercospora leaf spot.

Harvesting

Harvest baby leaves at any time. For mature plants, cut outer leaves 1-2 inches above the ground, leaving the inner crown to grow continually. Harvest all season until a hard, killing freeze.

Storing

Don't wash leaves before storing. Store greens wrapped loosely in a damp paper towel inside a perforated bag in the crisper drawer. Use within 3-5 days.
Long term: Separate leaves from thick ribs. Blanch leaves for 2 minutes, plunge in ice water, dry completely, and freeze for up to a year.

Collecting Seeds

Cut into a paper bag to dry for 2 weeks. Rub to release clusters and sift out chaff. Store in airtight containers with silica packs. Seeds last 3-5 years.

Notes

A close relative of beets but grown exclusively for its nutritious leaves and colorful stalks (Ruby, Gold, Bright Lights). Moderate feeder; side-dress with compost or organic nitrogen-rich fertilizer 4 weeks after planting to boost continuous leaf production.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Sweet Potatoes

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Plant rooted slips outdoors 3-4 weeks after the last spring frost once soil is completely warm (70°F+). Highly sensitive to frost and cold soil.

How to Plant

Plant rooted slips 3-4 inches deep, burying the stem up to the top leaves.
Indoors: Grow slips 8-12 weeks before planting by suspending a mature tuber in water or burying it in damp sand under heat/grow lights.
Outdoors: Press slips directly into loosened, hilled soil mounds.
Between plants: 12-18 inches.
Between rows: 36-48 inches.
By square foot: 1 plant per 1.5-2 square feet (sprawling vines).

How Long It Takes

Produces food in 90-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 75-95°F.
Water: 1 inch per week. Drought tolerant once established; stop watering 2 weeks before harvest.
Soil pH: 5.5-6.5 (prefers loose, well-drained sandy loam).
Common pests: Sweet potato weevils, wireworms, flea beetles, root-knot nematodes.

Harvesting

Harvest in autumn before the first frost when vines begin to yellow. Carefully dig around the hill with a spading fork, being gentle to avoid bruising the delicate skins.



Storing

Do not refrigerate whole raw tubers; cold temperatures ruin flavor and cause a hard core. Cure immediately in a warm, humid room (80-85°F, 85% humidity) for 10-14 days to develop sugars and heal wounds. Store unwashed in a dark pantry (55-60°F). Lasts 4-7 months.
Long term: Cook, mash, and freeze for up to a year.

Collecting Seeds

Propagated via vegetative slips rather than seeds. To save for next year, select undamaged, healthy tubers from your harvest and store them carefully to sprout slips the following spring.

Notes

Sprawling vines make an excellent heat-tolerant ground cover or living mulch. The young leaves and shoot tips are fully edible and can be harvested throughout the summer to eat like spinach. Avoid high-nitrogen fertilizers, which cause massive vine growth but tiny, skinny roots.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Tomatoes

Pollination: Self
Lifespan: Perennial/Annual

When to Plant

Start seedlings 6-8 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/4-1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/ small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 24-36 inches.
Between rows: 36-48 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 60-90 days (2-3 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 70-80F.
Water: 1-1.5 inches per week.
Soil pH: 6-6.8
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Gently twist tomatoes until they come off the vine, or cut using shears. Leave a few leaves on to maximize shelf life. You can pick them a little early and let them finish ripening indoors, at room temperature, not in direct sunlight.



Storing (Don't Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture. Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Pick a fully ripe tomato. Cut it open and scoop out the seeds. Ferment them 2-4 days, then dry them for 2-3 more days before storing.

Notes

Tomatoes are technically perennials, but they don't survive frost. When fertilizing, avoid adding too much nitrogen. It can reduce the amount of fruit produced.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Wild Tomatillos

Pollination: Insect
Lifespan: Annual



When to Plant

Start seeds indoors 6–8 weeks before last spring frost, or direct sow after all frost danger passes and soil is warm (70°F+). Highly sensitive to frost.

How to Plant

Plant seeds 1/8 to 1/4 inch deep.
Indoors: 2–3 seeds per plug. Thin after sprouting. Transfer after 6–8 weeks. Harden off 3–4 days. Can bury stems deeply like tomatoes.
Outdoors: Sow after soil warms. 2–3 seeds every 12 inches; thin to strongest.
Between plants: 18–24 inches.
Between rows: 24–36 inches.
By square foot: 1 plant per 2–4 square feet (sprawling, bushy habit).

How Long It Takes

Produces food in 65–80 days (2–3 months).

Care/Best Growing Conditions

Sun: 6–8 hours full sun.
Temperature: 70–90°F.
Water: 1 inch per week.
Soil pH: 6.0–7.0
Common pests: Husk tomato ground beetles, hornworms, aphids, flea beetles.

Harvesting

Harvest when the fruit fills out the papery husk, causing the husk to split open at the bottom and turn tan or light green. Fruits often drop to the ground when perfectly ripe.

Storing

Leave the papery husks on. Store unwashed in a single layer in a paper bag or open container in the crisper drawer. Use within 2–3 weeks.
Long term: Remove husks, wash sticky residue, pack whole or chopped, and freeze for up to a year.

Collecting Seeds

Ferment fully ripe, dropped fruits in a jar of water 2–3 days, rinse away floating pulp/unviable seeds, and strain the heavy seeds from the bottom. Dry on parchment paper for 2 weeks. Store in airtight containers with silica gel packs. Seeds last 4–6 years.

Notes

Wild tomatillos grow as sprawling bushes. You must plant at least two distinct plants for cross-pollination, or they will produce empty husks with no fruit. Reseeds aggressively.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Turnips

Pollination: Insect
Lifespan: Bienniel



When to Plant

Direct sow 2-3 weeks before the last spring frost. Plant successions every 2 weeks until warm weather arrives. Sow again in late summer (60-70 days before the first frost).

How to Plant

Plant seeds 1/4-1/2 inch deep.
Indoors: Not recommended; turnips are taproots and do not transplant well.
Outdoors: Direct sow 1-2 inches apart. Thin seedlings to 3-4 inches apart once they reach 2-3 inches tall (eat the thinnings as microgreens).
Between plants: 3-6 inches (3-4 inches for standard roots; 6 inches for large roots).
Between rows: 12-18 inches.
By square foot: 9 per square foot.

How Long It Takes

Produces greens in 30-40 days and roots in 45-60 days.

Care/Best Growing Conditions

Sun: 6-8 hours full sun.
Temperature: 40-60°F optimal. Tolerates light to moderate frosts (down to 20-25°F).
Water: 1-1.5 inches per week.
Soil pH: 6.0-7.5.
Common pests: Flea beetles, root maggots, aphids, slugs, cabbage loopers, armyworms.

Harvesting

Harvest greens anytime once they reach 4-6 inches tall, leaving the crown intact so leaves regrow. Pull roots when they reach 2-3 inches in diameter; oversized roots turn woody and pithy.

Storing

Twist or cut off the greens 1 inch above the crown, as leaves draw moisture from the root. Store unwashed greens in a perforated bag with a damp paper towel for 3-5 days. Store unwashed roots in a perforated plastic bag in the crisper drawer for 1-2 weeks (or in damp sand/sawdust at 32-40°F with high humidity for 4-5 months). Long term: Peel, cube, blanch for 2-3 minutes, cool in ice water, drain, and freeze for up to 10-12 months.

Collecting Seeds

Plants will bolt in year two and produce yellow flowers and seed pods. Let pods turn brown and brittle on the stalk before harvesting, drying indoors for 1-2 weeks, and shelling. Seeds remain viable for 4-5 years in a cool, dry, airtight container.

Notes

Avoid high-nitrogen fertilizers. Rotate out of brassica beds for 3-4 years to prevent pests.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Zucchini

Pollination: Insects
Lifespan: Annual

When to Plant

Start seedlings 3-4 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/2-1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 18-36 inches.
Between rows: 36-48 inches.
By square foot: 1 per 1-2 square foot.

How Long It Takes

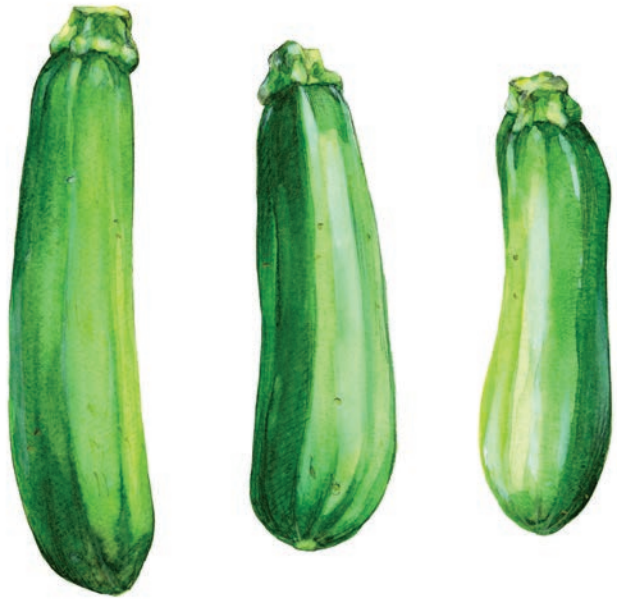
Produces food in 45-55 days (2 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest zucchini when they're at least 4 inches long, or 6-8 inches for full adult sizes. Twist or cut 1-2 inches above the fruit. (Cutting is best to avoid damage.)



Storing (Refrigerate)

Don't wash. Store in a perforated bag in cool, humid place away from fruits or veggies that produce ethylene gas (apples, avocados, tomatoes). Add a paper towel to absorb moisture.
Long term: blanch for 3 minutes, dry, and freeze for up to a year.

Collecting Seeds

Pick a fully ripe or overripe zucchini. Cut it open and scoop out the seeds. Dry them for 3-4 days. You can also ferment them first. Make sure they're completely dry before storing.

Notes

Zucchini doesn't deal well with cold temperatures and will halt growth below 50F. Heavy feeder. Side-dress after transplanting and once per month until harvest. Stake tall plants. Likes mulch.

Conversions

1/8 inch = 3.175mm
1/4 inch = 6.35mm
1/2 inch = 12.7mm
1 inch = 2.54cm
1 foot = .3m
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

How to Forage

This chapter explains the basics of foraging. You'll learn some basic strategies as well as the best plants and weeds to harvest. You can take this knowledge wherever you go. You can also use it to cultivate a food forest in your yard or nearby areas, growing edible plants on the sly.



Can you really eat weeds?

Yes, you really can eat several types of weeds. You can forage for them, or you can grow them in your back yard. You can plant them according to square foot gardening methods like any other plant, or you can just scatter them in your yard and make a weed paradise. You can also scatter them in nearby woods or other areas to harvest in a truly worst-case scenario. Caution, they'll absorb whatever pollutants they grow around. There's some value in scattering edible weeds across your lawn. It won't look like food to the average passerby. Depending on your situation, that might be useful to you and your group. Tip: Your HOA neighbors might not like you scattering weeds that grow aggressively, so take that into consideration.

Basic Principles of Foraging

* Forage lightly. Don't take more than you need. Leave some to regrow.

* Forage with caution. Stay away from weeds growing near areas with a lot of traffic or industrial waste. Also be careful around areas treated with pesticide or weed killer. In an emergency, consume at your own risk.

* Cultivate with care. You can grow many of these weeds just like you'd grow a normal plant. You can start them indoors as seedlings in late winter (late January or early February) and transfer them outside. Many of them are resilient and self-seeding. Once you start them, you probably won't have to repeat this process. You can plant a few weeds per square foot. For weeds with deeper tap roots, plant them 1 to a square foot.

* Most of these weeds tolerate a range of soil conditions, with a pH 6-7. Some of them can tolerate slightly higher soil pH in the mid 7s.

* Just like plants, you can protect weeds from extreme cold with tunnels and row covers.

* If you're cultivating weeds in a garden, you'll need to manage them to keep them from taking over your other plants. Keep them in dedicated areas or beds. If they show up in unwanted places, snip the heads so they don't seed. Uproot them. Compost them. Don't use weed killer.

* If you struggle to identify a weed in the wild, don't eat it. Some weeds have lookalikes that are toxic. This guide lists some of the most common doppelgangers.

* Generally, you'll consume the leaves and stems of weeds raw or steamed, prepared however you like in salads or stir fry dishes. You can often chop up the roots for use in soups and stews.

* Wash the leaves and scrub the roots gently, like you'd do with other plants. You'll often want to have a bowl of cold water with vinegar and/or lemon to soak roots in after chopping, to keep them from discoloring.

* Many of these plants also have medicinal value, something covered later.

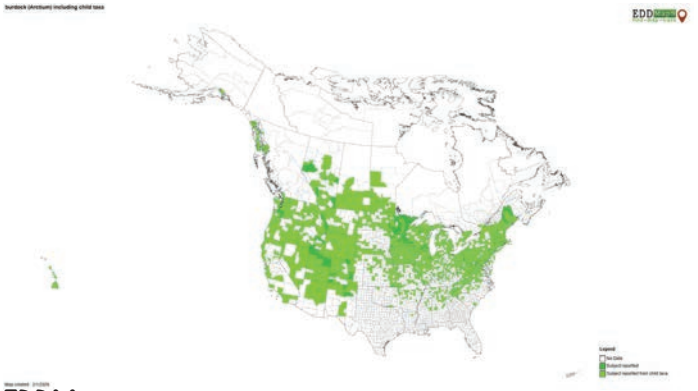
Burdock



Pollination: Self
Lifespan: Biennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1 plant per square foot. Can start earlier indoors.

Hardiness

Prefers cooler weather 50-75F but can tolerate heat and drought.

Which Parts Can You Eat?

You can eat the root, stems, leaves, and immature buds. Foragers say the stalks taste like asparagus or artichoke.

Nutritional Value

Fiber, Vitamins B6 (18% DV), Iron (5%), Calcium (4%), Copper (11%), Magnesium (11%), Manganese (13%), Potassium (8%), Phosphorus (5%)
85 Calories per cup

How Do You Cook It?

Peel and boil the stem. Boil 2 minutes for crunchy, 8 minutes for full cook. Then you can fry or saute. For roots, clean and quick soak them in water with vinegar. Then chop and roast or stir fry. Add other spices or ingredients of your choice. Also makes a good soup.

Notes

Burdock lives for two years. Stems and leaves taste best during the first year, before it flowers and seeds. Harvest the plant during the first 8-12 months, and collect seeds to plant the following spring. It will also seed itself, making your life easier. If you're only harvesting roots, you can harvest during the second year to maximize size. Harvest before it flowers. Avoid if you're pregnant or have kidney problems. In the wild, don't mistake it for water hemlock or belladonna. Water Hemlock has purple streaks on its stems and white flowers shaped like umbrellas. Belladonna produces black berries.

Collect burdock seeds by drying the heads for 1-2 weeks, then cracking open the burs. You can also crush the heads and winnow out the seeds, then store in a dry place.

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60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Clover

Pollination: Insects
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, scatter casually, about 2 ounces per 1,000 square feet.

Hardiness

Once established, tolerates heat and drought very well. Treat it like grass, it will thrive.

Which Parts Can You Eat?

You can eat every part, from root to flower.

Nutritional Value

Protein, Fiber, Iron, Calcium, Vitamin A, Vitamin E, Vitamin B, Vitamin K (90% DV), Selenium (500% DV), Chromium (158% DV)
25 Calories per cup

How Do You Cook It?

You can use the leaves raw in salads or cook them up like spinach. You can also use the flowers in salads or grind them into flour or powder. The flowers also make sweet tea. You can also cook the roots. Eat in moderation to avoid stomach trouble. Boil or steam to aid digestion.



Notes

Clover belongs to the legume family. They return nitrogen to the soil. Like many other weeds, you can direct sow them by scattering after last frost. It grows fast, and it's ready for harvest in 30-40 days. White and red clover are perennial, so they last several years. Clover seeds itself, but you can also collect seeds as a backup in the late summer or early fall when the flowers wither and turn light brown. Dry the heads for 1-2 weeks, then crush them up and winnow out the seeds. Store in a cool, dry place.

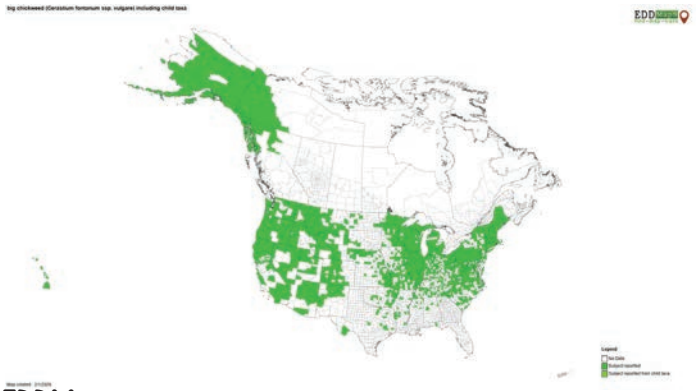
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Chickweed

Pollination: Self
Lifespan: Annual

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps



If You're Growing...

Direct sow after last frost, 2-3 plants per square foot. Can start earlier indoors.

Hardiness

Prefers cooler weather 50-68F. Doesn't do well in hot, dry weather. Does well in cold.

Which Parts Can You Eat?

You can eat every part except the root.

Nutritional Value

Vitamins A, C, D, B, Iron, Calcium, Potassium, Magnesium, Zinc, Phosphorous, Manganese, Copper, Antioxidants
25 Calories per cup

How Do You Cook It?

You can use the leaves raw in salads or cook them up like spinach. You can also use the flowers in salads or other recipes. You can use the entire plant (except root) to make tea or even pesto.

Notes

Chickweed stacks up well to spinach in terms of nutrients and flavor. You can direct sow it after last frost. Once established, it takes care of itself. Just snip the top flowers and leaves. It grows back. Like other self-pollinators, it can seed itself for the next growing season. Chickweed grows in thick mats. It grows pretty much year round. It can withstand frost, even light snow.

Collect chickweed seeds during the late summer or early fall by harvesting the pods when they turn brown and brittle. Dry them for 1-2 weeks, then winnow and sift out the seeds to store in a cool, dry place.

Caution, experts note that it can reduce milk supply for breastfeeding moms. Also, avoid the lookalike Scarlet Pimpernel. Tell it apart by orangish red flowers, and the lack of hairs on the stem. Other plants like spurge look similar, but the stems ooze milky sap when you break them.

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60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Curly Dock



Pollination: Insects
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1 plant per square foot or even 2 square foot. Can start earlier indoors.

Hardiness

Prefers moist areas but tolerates drought. Can tolerate cold as well as heat.

Which Parts Can You Eat?

You can eat every part, but the roots are primarily used for medicine.

Nutritional Value

Protein (Seeds). Fiber. Vitamins A and C, Iron, Calcium, Potassium, Magnesium, Phosphorus.
20 Calories per cup

How Do You Cook It?

You can use the leaves raw in salads or cook them up like spinach. You can peel the stalks and prepare them like green beans. Roast the seeds or grind them into flour. Harvest leaves when they're young. Harvest the stalks before they flower. Harvest the seeds in late summer or fall.

Notes

Curly dock is a tough plant that can regrow from its long taproots. It can handle some of the harshest environments. Sow it during early spring or early fall. The root is edible, but it doesn't taste very good.

Collect curly dock seeds in later summer or fall by cutting or tearing off the stems at the base. The seeds will appear as dark reddish brown clusters. Strip them into a bag and dry for 1-2 weeks, then crush and winnow them. Store them in a cool, dry place.

Like many weeds and wild plants, curly dock contains a lot of oxalic acid that can pose a risk for anyone with kidney stones or gout.

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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Dandelion

Pollination: Self
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1-4 plants per square foot. Can start earlier indoors.

Hardiness

Prefers temperatures 60-70F, but it tolerates heat and drought well.

Which Parts Can You Eat?

You can eat every part, including the root.

Nutritional Value

Protein, Fiber, Vitamins K, A, and C. Antioxidants. Calcium, Potassium, Iron.
25 Calories per cup

How Do You Cook It?

You can fry the flower heads or use them to make wine, jelly, and syrup. You can also use them in salads. You can make tea or coffee from the roots (no caffeine), or cook them up like carrots. You can technically eat the stem, but it's bitter.



Notes

Dandelion is one of the lowest maintenance plants, known for its resilience. It contains more Vitamin A than spinach, and more Vitamin C than tomatoes. You can harvest it at any time. For the best taste and nutrients, harvest the leaves in early spring. Harvest the roots in early spring or late fall.

Collect dandelion seeds when any of the flower heads turn into white fluffy balls, especially brown and dried out ones. Collect the stems with the balls. Dry them for 1-2 weeks. Winnow to remove the seeds from the white pappus (parachutes). Store them in a cool, dry place.

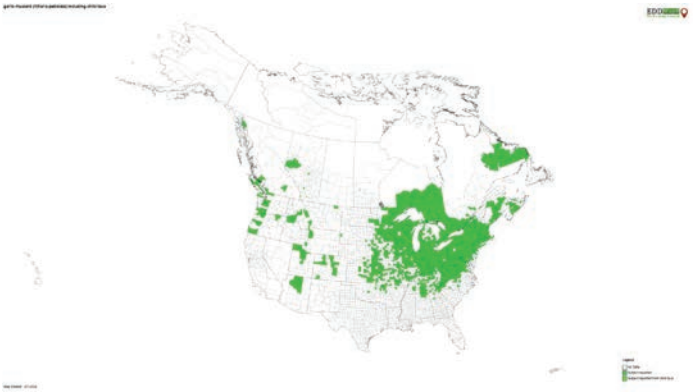
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90 Degrees F = 32C
100 Degrees F = 38C

Garlic Mustard

Pollination: Self
Lifespan: Biennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps



If You're Growing...

Direct sow after last frost, 1 plant per square foot or even 2 square foot. Can start earlier indoors.

Hardiness

Does best in cool environments. Doesn't thrive in hot, dry places.

Which Parts Can You Eat?

You can eat every part, including the leaves, flowers, and roots.

Nutritional Value

High in Vitamins A, C, E, and Omega-3 fatty acids.

How Do You Cook It?

You can use the leaves raw in salads or cook them up like spinach. You can also use the leaves and flowers in pesto.

Notes

Garlic mustard contains more nutritional value than kale, spinach, and broccoli. It grows fast, and it's very hard to eradicate once it's established (a good thing for foragers). It also contains zinc and fiber. Eat them younger for best flavor and safety. Older plants contain small amounts of cyanide.

Collect garlic mustard seeds in mid-summer when the pods turn brown and brittle. Strip the pods into a bag. Dry for another 1-2 weeks, then winnow. Store them in a cool, dry place.

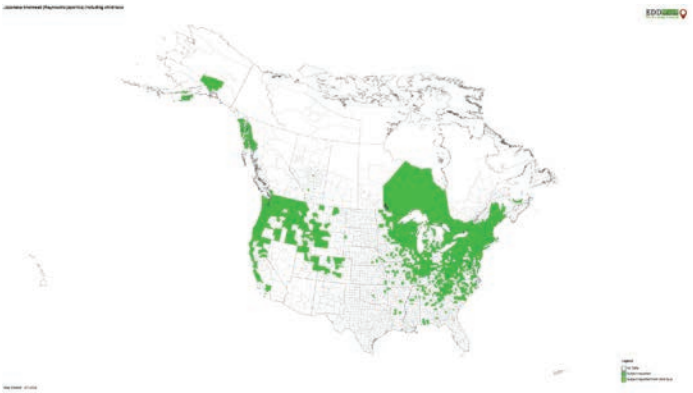
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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Japanese Knotweed

Pollination: Insects
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps



If You're Growing...

Direct sow after last frost, several plants per square foot.

Hardiness

Prefers moderate temperatures and moist soil, but very good at tolerating extreme weather.

Which Parts Can You Eat?

You can eat every part, including the root (mostly medicinal).

Nutritional Value

Vitamins A and C, Potassium, Phosphorus, Zinc, Manganese, Antioxidants, Rutin, Quercetin (Antiviral), Resveratrol (Cardiovascular).

How Do You Cook It?

Harvest young stems and leaves for use in salads. You can also use the shoots in sauces, pies, etc. Older shoots need peeling, but they're still edible. Chop and grind the root as an antioxidant, for medicine or a supplement.

Notes

Like other invasive weeds, be careful. Because Japanese knotweed is so resilient, it can overtake a garden. It's considered highly aggressive. It can regrow from its deep taproot, or even fragments of root.

Collect knotweed seeds during late fall, when the pods turn brown and brittle. Strip the pods into a bag. Winnow, then store in a cool, dry place. Handle the seeds with extreme care to avoid spreading them.

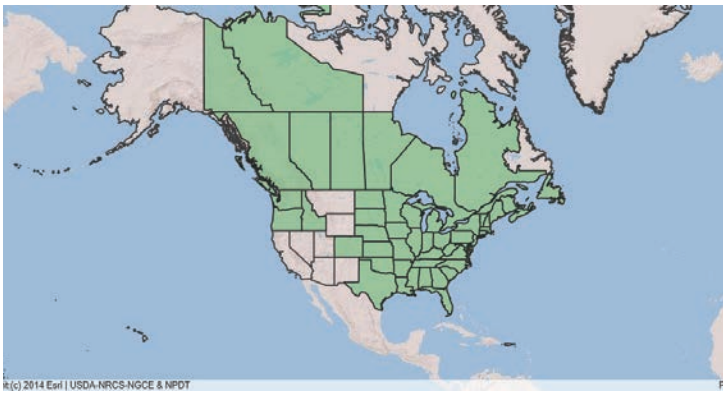
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80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Jewelweed

Pollination: Self
Lifespan: Annual

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1-4 plants per square foot. Can start earlier indoors.

Hardiness

Prefers wet conditions. Doesn't tolerate heat or drought very well.

Which Parts Can You Eat?

You can eat every part, including the root (mostly medicinal).

Nutritional Value

Quercetin (Antiviral), Kaempferol (Antiviral), Lawsone (Antioxidant)

How Do You Cook It?

Use stems, leaves, and flower heads in salads. Soak and boil to make them taste less bitter. Pods contain seeds that taste like nuts.



Notes

Foragers know jewelweed mainly for its medicinal use, because it's high in antimicrobial compounds like quercetin. They also use it to treat poison ivy and bug bites. Just mash them up and apply them directly to bites or rashes. They help soothe the pain. Harvest by cutting the top 1/3 of the plant, or 1/4 if you want it to regrow. It's best to harvest from the middle of summer through early fall.

Collect jewelweed seeds in late summer or early fall, when the pods turn yellow and brittle. Gently tap the pods into a bag. Dry for 1-2 weeks, then winnow. Store in a cool, dry place.

Jewelweed contains a lot of oxalic acid, which can be rough on digestive systems and especially anyone with kidney issues. You can reduce oxalic acid by boiling and tossing the water (1-2 times).

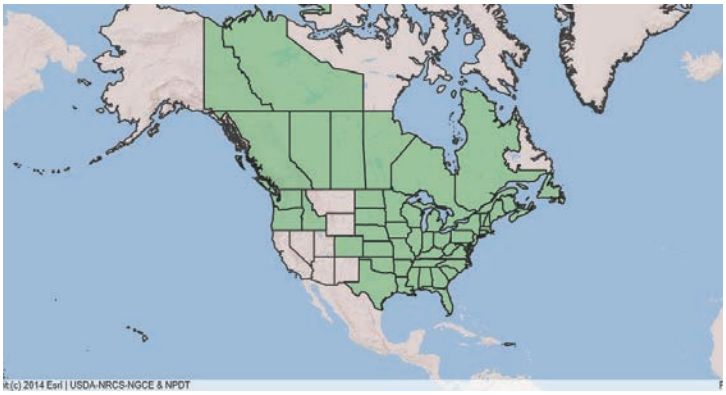
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70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Kudzu

Pollination: Self
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Extremely easy to plant. Sow or scatter seeds in late fall for spring blooming. Highly invasive...

Hardiness

Thrives in a wide range of environments. Can tolerate extreme cold and heat.

Which Parts Can You Eat?

You can eat every part, including the root (high in carbs and other compounds).

Nutritional Value

Leaves and shoots are rich in protein and fiber. Roots are rich in carbs. Plus more.

How Do You Cook It?

You can eat kudzu leaves, flowers, and stems raw in salads. You can also use the roots (and other parts) in soups and stews. Some cultures grind kudzu into flour. You can make jellies and jams from the flowers. It's versatile.



Notes

Especially in the southern U.S., kudzu has developed a reputation as perhaps the most invasive and resilient weed out there. But many people don't know that it's edible and has an astonishing nutrition profile. Young leaves and shoots are high in protein and fiber. The roots also contain considerable carbohydrates. It contains a range of compounds that promote overall health, including ones (like puerarin) that help with menopause symptoms. It's also rich in antioxidants. In Chinese medicine, it's been used to treat heart problems and improve blood flow.

Kudzu is high enough in protein, vitamins, and carbohydrates to heavily supplement your diet. It's extremely easy to plant. You can literally just throw some vines in your yard. It grows incredibly fast, up to a foot a day.

Warning: It can interfere with hormone therapies and has effects similar to estrogen, especially in large quantities.

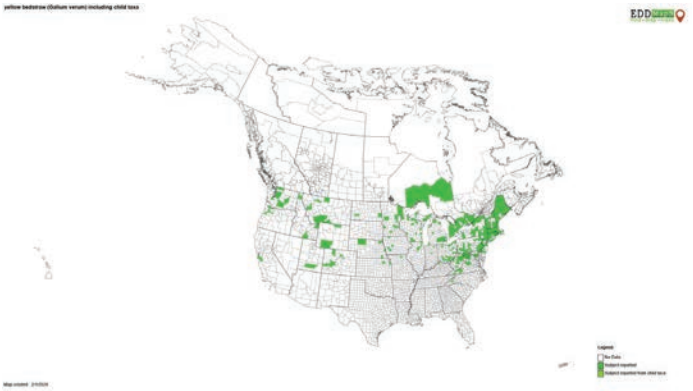
It can be easy to confuse kudzu with poison ivy. Remember, kudzu has hairy stems and very large, rounded, matte textured leaves. Poison ivy has smaller, smooth, pointed, shiny leaves.

Lady's Bedstraw

Pollination: Self
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps



If You're Growing...

Direct sow after last frost, 1-4 plants per square foot. Can start earlier indoors.

Hardiness

Prefers full sun. Once established, tolerates heat and drought very well.

Which Parts Can You Eat?

You can eat the flower heads, leaves, stems, and seeds.

Nutritional Value

Antioxidants, Silica, Iodine, Potassium
55 Calories per Cup

How Do You Cook It?

Use stems, leaves, and flower heads in salads. You can use the seeds for a coffee or tea substitute. Harvest when young. You can steam or roast any part of the plant to improve the texture and taste.

Notes

It's best to harvest the flowers and stems in the middle of summer or early fall. It's best to harvest the roots later in the fall (October), from more mature plants 3 years or older.

Collect bedstraw seeds in the fall, when the seed heads turn brown and brittle. Strip the heads into a paper bag. Dry for 1-2 weeks, then winnow. Store them in a cool, dry place.

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60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Lambsquarter

Pollination: Self
Lifespan: Annual

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1-4 plants per square foot. Can start earlier indoors.

Hardiness

Prefers full sun, 60-70F, but can tolerate heat and drought.

Which Parts Can You Eat?

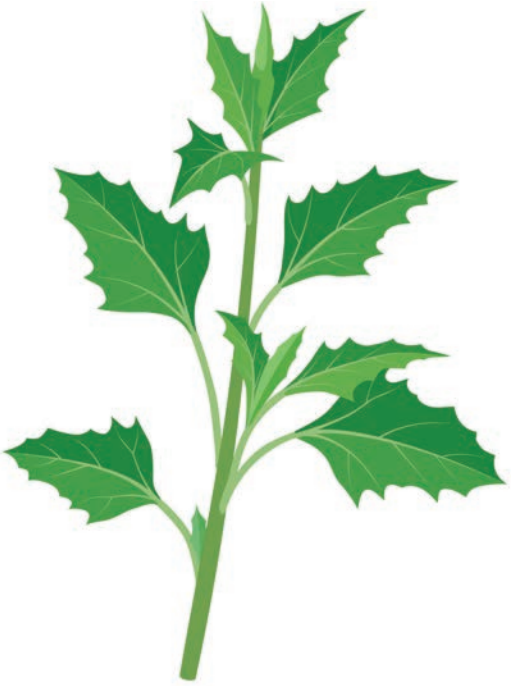
You can eat the flower heads, leaves, stems, and seeds.

Nutritional Value

Vitamin A (64% DV), Vitamin C (89% DV), Vitamin K (112 % DV), Calcium (31% DV), Iron (7% DV), Magnesium, Potassium
43 Calories per Cup

How Do You Cook It?

Use stems, leaves, and flower heads in salads. You can use the seeds in any dish, but especially soups and cereals. Cook older leaves to reduce oxalic acid.



Notes

Many parts of the world cultivate lambsquarter like spinach, because it tolerates heat and drought better. It's considered a weed in North America, despite its nutritional value. The base of leaves near the stems have a powdery white texture. It grows from late spring through early winter. You can cultivate it like many other plants, and it grows fast. You can often harvest it as early as 40 days after planting.

Collect lambsquarter seeds in later summer and fall when the seed heads turn brown and brittle. Collect the stems and dry for 1-2 weeks, then winnow. Store them in a cool, dry place.

Special note: Dog's Mercury looks like lambsquarter, but it's toxic. Dog's Mercury has hairy leaves with serrated edges, compared to lambsquarter's wavy edges. It smells bad when crushed. The leaves lack the white, powdery texture of lambsquarter leaves.

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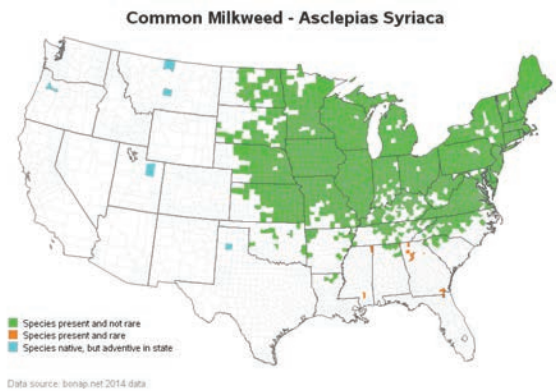
Milkweed

Pollination: Insects
Lifespan: Perennial



Where Does it Grow?

Grows almost anywhere in temperate climates.



Bonap.net

If You're Growing...

Direct sow after last frost, 1 plant per square foot. Can start earlier indoors.

Hardiness

Does best with full sun and watering, but can tolerate drought and heat.

Which Parts Can You Eat?

You can eat the flower heads, leaves, stems, and seeds.

Nutritional Value

Protein (High), Amino Acids (High)

How Do You Cook It?

It's best to harvest when they're young. Important: Boil the entire plant and then saute. For older plants, harvest the young tender leaves. You can fry the flower heads like okra. You can harvest young seeds and pods for casseroles and soups.

Notes

Make sure you boil milkweed 10-20 minutes before eating. It's toxic when consumed raw. It's especially toxic to small animals and livestock.

Collect milkweed seeds in the fall when the pods turn brown and brittle. Strip the pods into a bag. Dry for 1-2 weeks. Then winnow. Store them in a cool, dry place.

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60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Pineappleweed



Pollination: Self
Lifespan: Annual

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1 plant per square foot. Can start earlier indoors.

Hardiness

Does very well in hot, dry conditions as well as poor soil.

Which Parts Can You Eat?

You can eat every part, except the root.

Nutritional Value

Mainly Antioxidants

How Do You Cook It?

You can use young leaves in salads raw. You can cook older leaves in soups or stews. You can use the flower heads for tea, syrups, jellies, etc.

Notes

Pineappleweed grows fast, reaching maturity in less than 100 days. It grows throughout the year, but mainly spring through fall. If you're cultivating, sow it in spring after the last frost. The tea also works as a mild sedative, similar to chamomile, according to many foragers.

Collect pineappleweed seeds in the late summer and fall when the flower heads turn brown and brittle. Strip the heads into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

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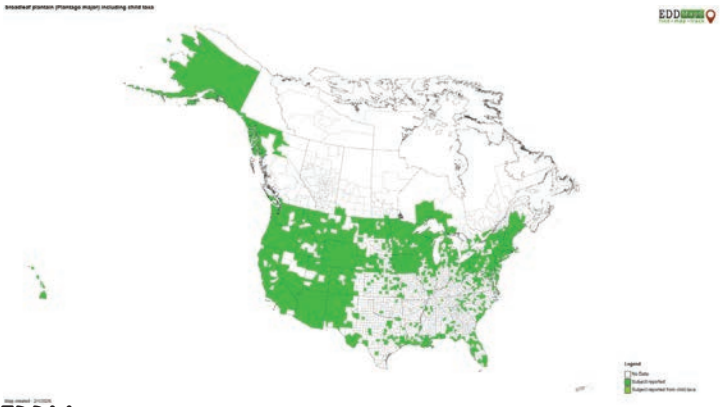
Plantago (Plantain)



Pollination: Self
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 9-16 plants per square foot. Can start earlier indoors.

Hardiness

Does very well in hot, dry conditions as well as poor soil.

Which Parts Can You Eat?

You can eat every part, except the root.

Nutritional Value

Fiber, Vitamin B, Vitamin C (High), Potassium (High), Magnesium, Iron, Zinc, Calcium
25 Calories per cup

How Do You Cook It?

You can use young leaves in salads raw. You can cook older leaves in soups or stews. You can also eat the flower head and cook the roots. The seeds can make meals similar to quinoa.

Notes

Plantago grows from late spring to early fall. You can cultivate it like many other plants, and it's low-maintenance. It also has medicinal value for mosquito bites and rashes. Chop or mash the leaves and put them on your skin.

Collect plantago seeds in the late summer and fall when the seed spikes turn brown and brittle. Strip the spikes into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

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70 Degrees F = 21C
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90 Degrees F = 32C
100 Degrees F = 38C

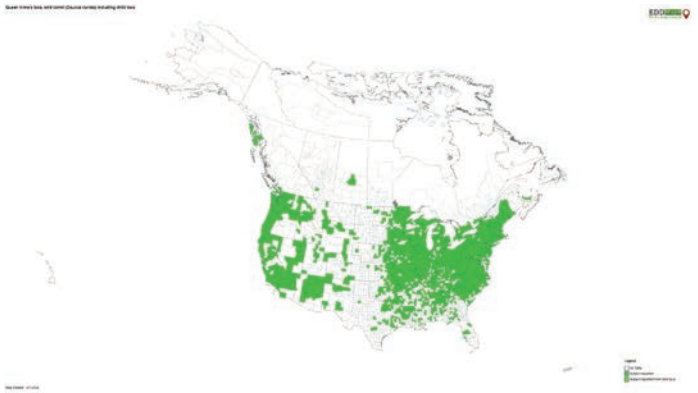
Queen Anne's Lace



Pollination: Self
Lifespan: Biennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

Hardiness

Can tolerate heat, drought, and even poor soil very well.

If You're Growing...

Direct sow after last frost, 1 plant per square foot. Can start earlier indoors.

Which Parts Can You Eat?

You can eat every part, including the root.

Nutritional Value

Vitamin C, Vitamin Bs, Calcium, Potassium, Anti-oxidants, Fiber.

How Do You Cook It?

You can cook the plants and stems like spinach. You can use the flower heads for syrups and jellies. You can grind the seeds as a spice. You can cook the roots up like carrots, and they taste similar.

Notes

Be careful with identification. Poison Hemlock looks similar to Queen Anne's Lace, except it has smooth stems (not hairy). It also smells bad. Queen Anne's Lace often has a single purple spot on the flower head, but Poison Hemlock has purple spots on the stems.

Collect queen anne's seeds in the late summer and fall when the seed heads turn brown and brittle. Strip the heads into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Quickweed

Pollination: Self
Lifespan: Annual

Where Does it Grow?

Grows almost anywhere in temperate climates.



Bplant.org



Hardiness

Can tolerate heat, but doesn't do well in drought.

If You're Growing...

Direct sow after last frost, 1-2 plants per square foot. Can start earlier indoors.

Which Parts Can You Eat?

You can eat every part, including the root.

Nutritional Value

Protein, Fiber, Vitamin A, Vitamin C, Calcium (High), Magnesium, Potassium, Iron, Zinc, Vitamin Bs.

How Do You Cook It?

You can cook up the leaves and stems like spinach. You can chop the root and roast, boil, or saute.

Notes

Quickweed earns its name by growing very fast.

Collect quickweed seeds in the late summer and fall when the flower heads turn brown and brittle. Strip the heads into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

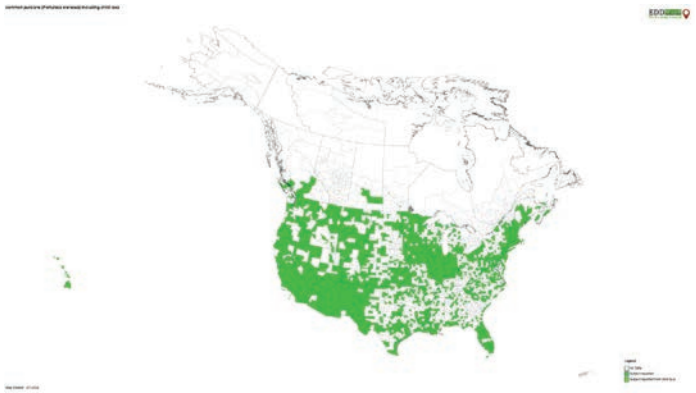
0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Purslane

Pollination: Self
Lifespan: Annual

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps



If You're Growing...

Direct sow after last frost, 4-9 plants per square foot. Can start earlier indoors.

Hardiness

Does very well in hot, dry conditions.

Which Parts Can You Eat?

You can eat every part, except the root.

Nutritional Value

Vitamin A (44% DV), Vitamin C (35% DV), Vitamin E (81% DV), Potassium (14% DV), Magnesium (17% DV), Iron, Calcium, Omega 3s. 20 Calories per cup

How Do You Cook It?

You can cook the entire plant like spinach, or just the leaves and stems. They also go well in salads, raw. You can also grind up the seeds as flour, or put them in dishes.

Notes

Purslane tolerates a range of conditions. It grows fast, and it's ready to harvest after about 50 days. It can even grow in sidewalk cracks. The seeds can last up to 40 years. Like other weeds, it's high in oxalic acid.

Collect purslane seeds in the late summer and fall when the seed pods turn brown and brittle. Shake the pods into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

0 Degrees F = -17.8C
32 Degrees F = 0C
60 Degrees F = 15.6C
70 Degrees F = 21C
80 Degrees F = 27C
90 Degrees F = 32C
100 Degrees F = 38C

Stinging Nettles

Pollination: Self
Lifespan: Perennial



Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1 plant per square foot. Can start earlier indoors.

Hardiness

Prefers full sun. Does well in heat, but doesn't do well in drought.

Which Parts Can You Eat?

You can eat the stems, leaves, and seeds.

Nutritional Value

Vitamin K (High), Vitamin A (High), Vitamin C, Vitamin Bs

How Do You Cook It?

You can cook up the plants and stems like spinach. Unlike other weeds that can go in salads raw, you have to cook stinging nettles to neutralize the bristles. The seeds taste like nuts.

Notes

Make sure to wear gloves when harvesting, and harvest them when they're young. Adult plants don't taste good, and they develop cystoliths (crystals).

Collect nettle seeds in the late summer and fall when the seed clusters turn brown and brittle. Shake the clusters into a paper bag. Wear gloves to avoid injury. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

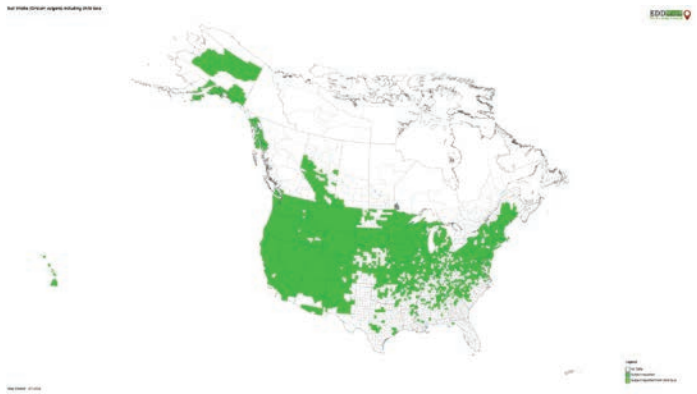
Thistle



Pollination: Self
Lifespan: Biennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



EDDMaps

If You're Growing...

Direct sow after last frost, 1 plant per square foot or even 2 square foot. Can start earlier indoors.

Hardiness

Prefers full sun. Once established, does well in heat and drought.

Which Parts Can You Eat?

You can eat every part, including the root.

Nutritional Value

Vitamin K (High), Vitamin A (High), Iron, Calcium, Magnesium, Phosphorus, Zinc, Copper, Fiber, Protein, Antioxidants

How Do You Cook It?

You can eat the root raw or cook it. You have to remove the spines from leaves. Eat or cook the rest like any other weed, as you prefer.

Notes

A relative of artichoke, thistle tastes and cooks up similar. Plant it in spring after last frost. The root tastes similar to burdock. You have to remove the spines from the leaves before eating. Also, use extreme caution when harvesting in general. The spines are extremely sharp, and thistle can cause permanent eye damage. In fact, harvesting thistle leaves might be more trouble than it's worth in some situations, unless you're very desperate.

Collect thistle seeds in the late summer and fall when the heads turn brown and brittle. Strip or cut the heads into a paper bag. Wear gloves to avoid injury. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

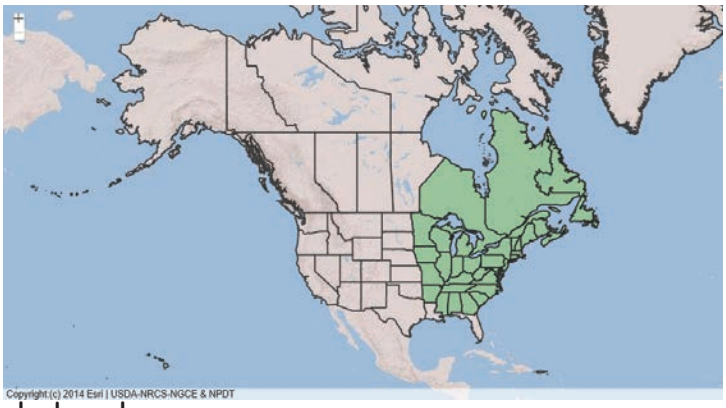
Wild Violets



Pollination: Self
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



plants.usda.gov

If You're Growing...

Direct sow after last frost, 3-4 plants per square foot. Can start earlier indoors.

Hardiness

Does best with shade and watering, and not especially tolerant to heat or drought.

Which Parts Can You Eat?

You can eat every part, but the root is mostly medicinal.

Nutritional Value

Vitamin C (High), Vitamin A (High), Vitamin Bs, Magnesium Iron, Potassium, Manganese, Copper

How Do You Cook It?

You can eat the leaves and stems like spinach. Use the flower heads in salads, or to make jellies, syrups, teas.

Notes

Wild violets grow best in the spring, between last frost and the beginning of summer. They'll continue to grow through early fall. You can cultivate them like any other plant. They have additional medicinal value as pain killers and cold medicine, with some antiviral properties.

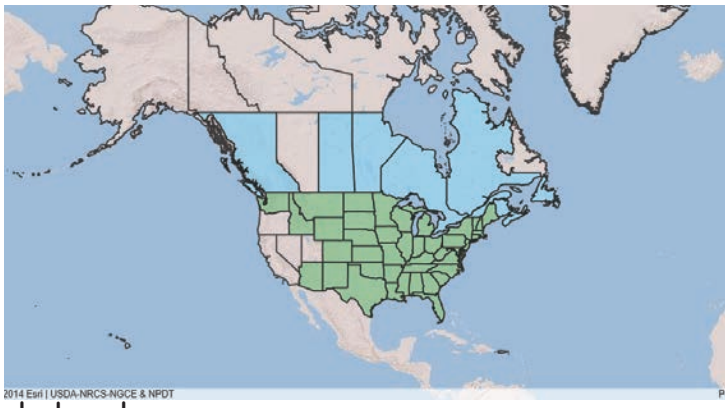
Collect wild violet seeds in the late summer and fall when the seed pods turn brown and brittle. Shake or cut the pods into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

Wood Sorrel

Pollination: Self/Insect
Lifespan: Perennial

Where Does it Grow?

Grows almost anywhere in temperate climates.



plants.usda.gov

If You're Growing...

Direct sow after last frost, 9-16 plants per square foot. Can start earlier indoors.

Hardiness

Does best with full sun and watering, but can tolerate drought and heat.

Which Parts Can You Eat?

You can eat every part, including roots/tubers.

Nutritional Value

Vitamin C (High), Vitamin A (High), Vitamin Bs, Magnesium Iron, Potassium, Manganese, Copper

How Do You Cook It?

You can eat the leaves and stems like spinach. The flowers can go into any dish raw. You can eat the seeds, and you can treat the roots/tubers like potatoes. Warning: Like a few other weeds, wood sorrel contains oxalic acid.



Notes

Wood sorrel typically grows best in spring and early fall, but it can survive winter. It grows fast, ready for harvesting in 30-40 days.

Collect wood sorrel seeds in the late summer and fall just before the seed pods turn brown and brittle. Cut the pods or stems into a paper bag. Dry them for 1-2 weeks, then winnow. Store them in a cool, dry place.

Medicinal Herbs

You can use dozens of herbs to treat various conditions and illnesses, including viral infections. You can take them in supplements from stores, but eventually you might need to make your own. This section covers common herbs and methods to make them.

Herbal Measurements

Most guides list recipes and measurements using "parts" or ratios. That way, you can use whatever specific measurement you want, scaling it up or down for your needs. Sometimes, you'll only be producing 1-2 ounces. Other times, you'll produce more.

Common Measurements

Drop: One small pinch from a dropper. A drop of alcohol and water have about the same volume. Other liquids don't. Recipes will clarify.

Dropperfull: About 30 drops. Many droppers only fill halfway per squeeze, so one dropperfull might mean two squeezes.

Milliliter (1 ml): About 20 drops

Teaspoon: 5 ml or 100 drops

Tablespoon: 15 ml, 3 teaspoons, 300 drops

Ounce: 2 tablespoons, 30 ml, 6 teaspoons, 600 drops

Pint: 2 cups, 16 ounces, .47 liters, 32 tablespoons

Quart: 2 pints, .95 liters

Types of Recipes

Tinctures

You submerge the herbs in strong alcohol at least 100-140 proof (50-70 percent). You can use vodka, rum, gin, and even bourbon. Many recipes call for 190 proof alcohols like Everclear, to maximize the extraction. Ratios typically involve 1:2 parts of fresh herbs and 1:5 for dried herbs (20-30 percent water, 70-80 percent alcohol). Recipes that list sub-ratios of water to alcohol don't refer to alcohol proof; that's separate. For dried herbs, that's 1 oz of herbs, about 1 oz of water, and 4 oz of alcohol. You can use fresh or dried herbs, chopped or crushed. You can make tinctures from leaves, flowers, seeds, bark, or roots. It all depends on your use and the recipe. Leave the mixture in a cool, dark place for 4-6 weeks. Shake it every day. Strain the mixture into a container like a glass jar or bowl and squeeze/press the herbs to get the rest out. That last part matters, because the wet herbs still contain potent compounds. Then, you can pour it into a tincture bottle, using a funnel. Tinctures last 3-5 years, even a decade if stored well.

Hot Infusions

You boil water and pour it over leaves, flowers, seeds, or roots. Let them steep for 4-8 hours in a sealed container. Seeds can take less time, even 1-2 hours or less. Roots can take more time, up to 8 hours. Some recipes take much less time, 15-20 minutes. Steep 1 ounce of leaves or flowers in 1 quart of water. Steep 1 ounce of seeds or roots in 1 pint. Measurements can vary by recipe. The mixture will cool as it steeps. That's fine. You don't have to reheat it. Squeeze or press the herbs to get the rest out before discarding them. You should drink hot infusions within 24 hours, and you can also refrigerate them. You only need heat for the extraction process. Sometimes, hot infusions will call for simmering instead of steeping. Here, the line between hot infusion and decoction (next page) starts to blur a little.

More Types of Herbal Recipes

Cold Infusions

Follow the same general process for hot infusions, but don't boil the water. Use room temperature or chilled water. Cold infusions steep for much longer (12+ hours). They're less common.

Decoctions (Strong Teas & Cough Syrups)

Add herbs to water at room temperature and then bring it to a boil. Usually, you're adding 1 oz of herbs to 1 pint of water. Simmer for 15-20 minutes. Let it cool, then strain it and press the herbs to remove the rest. Add water to bring it back up to 1 pint. You can make concentrated decoctions by boiling the water down to 1/2 a pint and leaving it in the stronger form. Take decoctions by the tablespoon, usually up to 4 times a day, or in potent teas. Decoctions last about 48 hours at room temperature, up to 4 days if refrigerated.

Juices

You generally soak or steep the herbs for several hours in water or oil, then press or squeeze them to release their nutrients. You can apply juices topically or consume them. This guide mainly covers tinctures, infusions, salves, poultices, and decoctions.

Salves & Poultices

For salves, pack 1 container, usually a jar, with crushed dried herbs. Cover it with olive oil or something similar, seal, and let infuse 4-6 weeks. Add 1-2 oz of beeswax or something similar to help it harden. You can make poultices in less time, usually by chopping up fresh herbs, adding some oil, and applying them to skin. Sometimes, you can even just apply the leaves directly to wounds and irritated areas.

Notes & Cautions

Most herbal recipes for infusions and decoctions assume you're going to use dried, ground leaves and roots or powders. For tinctures, you can use fresh or dried herbs. Since the recipes follow ratios and proportions, it doesn't matter as much.

Even when hot infusions call for shorter steeping times, longer 4 hour steeps can make more potent remedies (often more bitter). The same goes for decoctions. But generally, a 15 minute steep or simmer works well enough, especially if someone is very sick and you don't want to wait hours. You can always start with quick infusions while stronger ones are steeping. For most infusions, you can make a stronger decoction.

Growing herbs, you'll often have to scarify and stratify the seeds. That means roughen them up with sandpaper or files, then soaking them in a bag of sand or moist soil for 30-60 days. Sometimes, you do this with any seed. It comes up even more for herb seeds.

Anyone pregnant or breastfeeding should be careful with herbal use. So should anyone with kidney or liver trouble. Generally, strong herb mixtures are meant for use 2-3 weeks to treat acute illness and injury. Otherwise, enjoy them in milder teas. General side effects to most medicinal herbs can include nausea, headache, fever, and rashes.

Some herbs do interact with other supplements and drugs. This guide can't list them all, but common interactions include blood thinners, diabetes meds, heart medications, and immunosuppresants. If you or members of your group have a health condition, but you're interested in herbs, it's a good idea to get a few books.

Some Effective Herb Combinations

For Viral Infections & Encephalitis (Brain Inflammation & Swelling)

* 1 Part Licorice Tincture
* 1 Part Chinese Skullcap Tincture
* 1 part Isatis Tincture
* 1 part Houttuynia Tincture
* Dosage: 1/4-1 tablespoon, 6x per day.

* 1 Part Astragalus
* 1 Part Rhodiola
* 2 Parts Cordyceps
* Dosage: 1 teaspoon, 6x per day.
* Use with licorice, skullcap, isatis, houttuynia combo.

A Quick Reference for Medicinal Properties

* Adaptogen: Helps your body and mind adapt to stress.
* Adjuvant: Boosts other herbs and/or supplements.
* Analgesic: Relieves pain
* Antiemetic: Help with nausea and vomiting.
* Aperient: Laxative and/or improves digestion.
* Astringent: Tightens tissues.
* Balsamic: Helps with inflammation
* Carminative: Improves digestion.
* Demulcent: Good for sore throat/nose.
* Emetic: Induces vomiting.
* Emmenagogue: Helps with menstrual cycles.
* Expectorant: Decongestants/Helps with cough.
* Nervine: Supports nervous system health.

Scientific Names for Medicinal Herbs

* Astragalus Root (Astragalus membranaceus)
* Boneset (Eupatorium perfoliatum)
* Chinese Skullcap (Scutellaria baicalensis)
* Chinese (Senega Root Polygala tenuifolia)
* Cordyceps (Cordyceps)
* Echinacea (Echinacea purpurea)
* Elderberry (Sambucus Nigra)
* Ginger (Zingiber officinale)
* Houttuynia (Houttuynia cordata)
* Isatis (Isatis tinctoria)
* Licorice (Glycyrrhiza glabra)
* Lion's Mane (Hericium erinaceus)
* Lomatium (Lomatium dissectum)
* Mullein (Verbascum thapsus)
* Oregon Grape Root (Mahonia aquifolium)
* Pink-Striped Trumpet Lily (Crinum latifolium)
* Pleurisy Root (Asclepias tuberosa)
* Pokeweed (Phytolacca decandra)
* Red Root (Ceanothus americanus)
* Rhodiola (Rhodiola rosea)
* Yarrow (Achillea millefolium)
* Burdock (Arctium lappa)
* Chickweed (Stellaria media)
* Dandelion (Taraxacum officinale)
* Japanese Knotweed (Reynoutria japonica)
* Jewelweed (Impatiens capensis)
* Kudzu (Pueraria montana)
* Lambsquarter (Chenopodium album)
* Stinging Nettle (Urtica dioica)
* Pineappleweed (Matricaria discoidea)
* Plantain (Plantago major)

Astragalus Root

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Start seedlings 4-6 weeks before last frost. It helps to scarify and stratify.

How to Plant

Plant seeds 1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 24-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Harvest roots fall of 2nd/3rd year.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-85F.
Water: 1-2 inches per week.
Soil pH: 5.5-8.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest the roots in the fall of the second or third year. Dig them up with a fork. For longterm storage, dry 1-2 weeks. You can also use a dehydrator.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Supports immune system health. Helps heal wounds. Can also lower blood pressure and blood sugar levels in higher doses.

Tincture: Make with 1:2 ratio for fresh root. Make with 1:5 ratio for dry.

Tincture Dosage: 20-30 drops, 2-4x per day.

Decoction: 1 tablespoon dry root in 1 pint, simmer 20-30 minutes. Keep covered.

Decoction Dosage: 1 cup, 2-3x per day.

Cautions & Notes: Can interfere with blood pressure and diabetes medications, as well as immunosuppressants. Milder side effects include nausea, upset stomach, headache, and skin rashes.

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .47l
1 quart = .95l
1 gallon = 3.8l

Boneset

Pollination: Self
Lifespan: Perennial

When to Plant

Start seedlings 6-8 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/8 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 18-24 inches.
Between rows: 18-24 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces in 90-120 days (3-4 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-80F.
Water: 1-2 inches per week.
Soil pH: 5.5-8.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest boneset for tinctures during early bloom for the flowers. Clip flower heads or harvest entire plant, hang to dry for 4-6 weeks. For tea, harvest before blooming and dry.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Relatively strong antimicrobial properties against Influenza A. Also used to treat malaria and parasites. Traditionally, also used to help set broken bones.

Fresh Flower Tincture: Make with 1:2 ratio, highest proof alcohol available.

Dry Flower Tincture: Make with 1:5 ratio, 40 percent water.

Tincture Dosage: 30-40 drops, 3x per day.

Hot Infusion: 1 teaspoon in 8 oz, steep 15 minutes. Keep covered to retain oils.

Hot Infusion Dosage: 4-6 oz, 4x per day.

Cautions & Notes: In high doses, it can cause vomiting and upset stomach. Liver toxicity can happen with use longer than 1-2 weeks. Boneset tolerates cold very well, and the roots can survive drops into the negative temperatures. For hot infusions, drink when hot for best results.

1 teaspoon = 4.9ml
1 oz = 29.57ml
1 pint = .471
1 tablespoon = 14.78ml
1 cup = 240ml
1 quart = .951
1 gallon = 3.81

Chinese Skullcap

Pollination: Self
Lifespan: Perennial



When to Plant

Start seedlings 6-8 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 12-18 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces usable roots in 3 years.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-75F.
Water: 1-2 inches per week.
Soil pH: 6-7
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest skullcap roots during the spring of the third year for the most potency. Dry for 1-2 weeks. Use yellow roots. Greenish or black roots have oxidized too much. Don't use.

Collecting Seeds

See general instructions for collecting seeds.

Medicinal Information

Facts: Strong, broad antimicrobial properties against Adenovirus, EB Virus, Hepatitis, HIV, Influenza, Measles, Polio, RSV, SARS, Covid, and more. Also works against staph infections and pneumonia.

Fresh Root Tincture: Make with 1:2 ratio.

Dry Root Tincture: Make with 1:5 ratio, half water, half alcohol.

Tincture Dosage: 1/4-1/2 teaspoon 3x a day, up to 6x if very sick.

Hot Infusion: 1-2 teaspoon dried root or root powder in 8 oz of water, steep 15 minutes. Keep covered.

Hot Infusion Dosage: 3 cups per day.

Decoction: 1-2 teaspoons dried or powdered root in 8 oz of water, simmer 15-20 minutes. Keep covered.

Decoction Dosage: 2 oz, 3-4x a day.

Cautions & Notes: Side effects can include dizziness and drowsiness. Use the root for infections and respiratory health. Decoctions work best. Works well with licorice. Tends to reinforce and amplify many other herbs and pharmaceutical meds, good and bad.

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .471
1 quart = .951
1 gallon = 3.81

Chinese Senega Root

Pollination: Self
Lifespan: Perennial

When to Plant

Start seedlings 6-8 weeks before last frost. Stratify for 60 days first. Can also start from young shoot cuttings.

How to Plant

Plant seeds 1-2 inches deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 14-16 inches.
Between rows: 14-16 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces usable roots in 4 years.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-75F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest senega root during the fall of the fourth year. Dig up entire plant root with fork. If storing long term, dry in the sun 5-8 days. You can also use a dehydrator.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Originally used by indigenous Americans for snake bites, colds, and tooth pain. Also used to enhance cognitive function and improve focus, and to treat anxiety, insomnia, and depression.

Fresh Root Tincture: Make with 1:2 ratio.

Dry Root Tincture: Make with 1:5 ratio.

Tincture Dosage: 30 drops, 3x per day.

Hot Infusion: 1-2 teaspoons dried or powdered root in 1 cup, steep 15 minutes. Keep covered.

Hot Infusion Dosage: 2-3 cups per day.

Decoction: 1-2 teaspoons dried or powdered root in 8 oz of water, simmer 15 minutes. Keep covered.

Decoction Dosage: 2 oz, 3-4x a day.

Cautions & Notes: As with most herbs, side effects can include nausea and upset stomach, rashes, etc. Decoctions work better than hot infusions.

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .471
1 quart = .951
1 gallon = 3.81

Cordyceps

Pollination: Self
Lifespan: Perennial

When to Plant

It's a mushroom, so you can grow it year round indoors.

How to Plant

Starting out, you'll most likely use kits. Follow the specific instructions in them.

How Long It Takes

Ready to harvest in 7-8 weeks.

Care/Best Growing Conditions

See instructions.

Harvesting

Harvest after 7-8 weeks. Dry the mushrooms for longterm storage. Cut or crush into powder.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Supports immune health and energy levels. Also used to support kidney and liver function. Has also recently shown ability to lower blood pressure and blood sugar while increasing insulin sensitivity.

Tincture: Make with 1:5 ratio for dry mushrooms. After 4-6 weeks, strain. Simmer leftover mushrooms for 2-8 hours in 4 cups of water, then strain and press. Cool, then combine with alcohol extract in 3:1 ratio water to alcohol mix.

Tincture Dosage: 30 drops, 1-2x per day.

Hot Infusion: 1-2 teaspoons dried or powdered root in 1 cup, simmer 15 minutes. Keep covered.

Hot Infusion Dosage: 1 cup, 2-3x per day.

Cautions & Notes: Can interfere with diabetes medications and blood thinners. Too much can cause upset stomach.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .47l	1 quart = .95l
	1 gallon = 3.8l

Echinacea

Pollination: Insect
Lifespan: Perennial

When to Plant

Start seedlings 8-10 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 8-10 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-24 inches.
Between rows: 24-36 inches.
By square foot: 1 per 1-2 square foot.

How Long It Takes

Roots ready in the fall of 3rd or 4th year.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest echinacea leaves and flowers during the second year. Harvest the roots during the fall of the 3rd or fourth year. Dig up with a fork. Dry 1-2 weeks for longterm storage.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Supports immune system. Often used to fight infections. Can also be used on skin irritations, rashes, and wounds.

Root Tincture: Make with 1:2 ratio for fresh root, 1:5 for dry.

Tincture Dosage: 30 drops, 2-5x per day.

Hot Infusion: 1 tablespoon dried root in 10 oz, steep 15 minutes. Keep covered.

Hot Infusion Dosage: 1 cup, 2-3x per day.

Decoction: 1/2 oz dry root and 3 cups water, simmer 20 minutes. Keep covered.

Decoction Dosage: 1 cup, 2-3x per day.

Cautions & Notes: Can interfere with immunosuppressants. Use the roots for tinctures and infusions (most potent). Also use roots for salves. Use the flowers and leaves in milder teas.

1 teaspoon = 4.9ml
1 oz = 29.57ml
1 pint = .471
1 tablespoon = 14.78ml
1 cup = 240ml
1 quart = .951
1 gallon = 3.81

Elderberry

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Start seedlings 6-8 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/2-1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 72-96 inches.
Between rows: 72-96 inches.
By square foot: 1 per 3-4 square foot.

How Long It Takes

Produces berries in 1-2 years.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-80F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest elderberry in late summer of the first or second year. Cut entire stems. Harvest the ripe berries and leave the green ones behind. It's best to make syrup right away.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Strong, but narrower antimicrobial properties against Influenza, HIV, Herpes, Strep, E. Coli, and more.

Special Procedure for Elderberry Syrup: 1 cup of dried elderberries or 2 cups of fresh elderberries, 2 quarts of water, and anywhere from 2-3 cups or even several cups of sugar. The sugar stops bacterial growth. If you don't use as much sugar, add 20 percent alcohol to the final mix. Soak the elderberries overnight. Bring the elderberries to a boil and then simmer until reducing water to half volume, or 1 quart. Let it cool and then strain. Don't skim anything off. Syrup lasts up to 3-6 months in a sealed container, sometimes longer.

Dosage: 2-4 tablespoons every 2-4 hours.

Cautions & Notes: Can interfere with immunosuppressants and autoimmune disorder meds. Eating raw berries can cause extreme sickness. Elderberry doesn't do well in extreme heat or cold, so they'll need protection from both.

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .471
1 quart = .951
1 gallon = 3.81

Ginger

Pollination: Self
Lifespan: Perennial

When to Plant

Start buds/cuts from existing plant 5-6 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant buds 2-3 inches deep
Indoors: Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost.
Between plants: 6-12 inches.
Between rows: 30-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 240-300 days (8-10 months).

Care/Best Growing Conditions

Sun: 2-5 hours full sun, partial shade.
Temperature: 75-85F.
Water: 1-2 inches per week.
Soil pH: 5.5-6.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest ginger in late summer or early fall, after the leaves die back. Dig roots/rhizomes up with a fork and gently lift out. Can harvest "baby ginger" at 4-6 months.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Strong, general antiviral properties against Influenza, Hepatitis, Herpes, Yellow Fever, Measles, Chicken Pox, and more. Also works on burns and fungal infections. Also shows potential for managing high blood pressure and diabetes.

Fresh Root Tincture: Make with 1:2 ratio, highest proof alcohol available.

Tincture Dosage: 10-20 drops, 4x per day.

Hot Infusion: Chop or grate 1-2 inches of ginger into 1-2 cups of water, simmer 10-20 minutes. Keep covered.

Hot Infusion Dosage: 4-6 cups per day.

Cautions & Notes: High doses can interfere with blood pressure and diabetes meds. Can also cause problems with blood clotting. Ginger is a heavy feeder that depletes soil, so rotate it. Freshly juiced ginger works best for medicinal purposes, but tinctures also work. Dry root doesn't demonstrate very strong antiviral properties.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .47l	1 quart = .95l
	1 gallon = 3.8l

Houttuynia

Pollination: Self
Lifespan: Perennial

When to Plant

Start seedlings 3-4 weeks before last frost.
Once started, grows everywhere.

How to Plant

Plant seeds 1/2-1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-32 inches.
Between rows: 36-48 inches.
By square foot: 1 per 1-2 square foot.

How Long It Takes

Produces in 45-55 days (2-3 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-90F.
Water: 1-2 inches per week.
Soil pH: 5.5-6.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest houttuynia in the late spring or early summer, and harvest all year long once it's established.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Strong, relatively broad antimicrobial properties against Influenza A, SARS, Covid, Dengue, Herpes, and more. Also used to treat wounds and slow bleeding.

Fresh Leaf Tincture: Make with 1:2 ratio, highest proof alcohol available. 2 weeks, not 4-6.

Dry Leaf Tincture: Make with 1:5 ratio, half water and half alcohol.

Tincture Dosage: Up to 1/2 teaspoons 3x per day.

Decoction: 2 oz of leaf herb in 8 oz of water, simmer 15 minutes. Keep covered.

Decoction Dosage: 3-4 oz, 2-3x per day.

Cautions & Notes: High doses exceed 2-3 weeks can cause kidney damage. Once established, it grows extremely well and tolerates cold and heat very well. Considered invasive, hard to get rid of. The leaves are also edible, even raw. It's best for tinctures. Decoctions demonstrate less antimicrobial properties.

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .471
1 quart = .951
1 gallon = 3.81

Isatis

Pollination: Self/Insect
Lifespan: Biennial

When to Plant

Start seedlings 4-6 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant seeds 1/4-1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 12-24 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces food in 45-55 days (2 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 50-75F.
Water: 1-2 inches per week.
Soil pH: 6-8
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest isatis leaves in late spring, before the plant flowers. Cut about 1/3 and let it regrow. Harvest the roots in late fall or early spring, before it rebuds.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Strong, broad antiviral properties against Influenza A and B, SARS, Covid, Rubella, Measles, Chicken Pox, EB Virus, Hepatitis, Herpes, and more. Also used to treat encephalitis.

Fresh Leaf and Root Tincture: 2 parts leaves, 1 part root, 1:5 ratio with 25 percent alcohol. Bring to boil, add 1 tablespoon vinegar, and simmer for 30 minutes. Only add alcohol after the boiling process. Let sit for 2 weeks.

Tincture Dosage: 30 drops, 6x per day.

Decoction: 2-4 oz in 1 pint of water, simmer 30 minutes. Keep covered.

Decoction Dosage: 1 cup, 3x per day.

Cautions & Notes: Side effects from high doses or extended use include high blood pressure, bloody discharge, and serious breathing problems. Not recommended for use longer than 3 weeks or anyone with allergic reactions to aspirin.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .471	1 quart = .951
	1 gallon = 3.81

Licorice

Pollination: Self/Insect
Lifespan: Perennial



When to Plant

Start root cuttings with buds 4-6 weeks before last frost. Plant successions through early summer for continual harvest.

How to Plant

Plant root cuttings with buds 2-3 inches deep.
Indoors: Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost.
Between plants: 24-36 inches.
Between rows: 36-48 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces in 2-3 years (for roots).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest licorice root in early fall of the second year, after the leaves have died back. Wait until the third year for bigger, more potent roots. Dig up the roots with a fork.

Collecting Seeds

See general instructions for collecting seeds.

Medicinal Information

Facts: Strong, broad antiviral properties against Influenza A, SARS, Covid, RSV, Herpes, pox viruses, and more. Also used to treat encephalitis and tuberculosis.

Dry Root Tincture: Make with 1:5 ratio, 50 percent water.

Tincture Dosage: 30-60 drops, 3x per day.

Hot Infusion: 1 teaspoon in 8 oz of water, simmer 15 minutes. Keep covered.

Hot Infusion Dosage: 3 cups per day, 1 every two hours if very sick.

Decoction: 1-2 teaspoons powdered root in 16 oz of water, boil down to 8 oz.

Decoction Dosage: 4 oz, 4x per day.

Cautions & Notes: Licorice can cause heart problems or exacerbate existing ones, especially beyond 2 weeks. Once established, tolerates heat and cold well. If you're starting with seeds, you'll need to soak them for 2-3 weeks and then rough them up with sandpaper or a nail and soak again for 2-3 hours before planting. For medicine, licorice works best when combined with Chinese Skullcap.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .471	1 quart = .951
	1 gallon = 3.81

Lion's Mane

Pollination: Self
Lifespan: Perennial

When to Plant

It's a mushroom, so start it indoors anytime. Start in a substrate bag. Best to move outdoors when it's 60-70F.

How to Plant

It's best to get a substrate/saw dust kit with lion's mane included. Cut slits in the bag. Keep it in a semi-dark, cool place at 60-70F for about 2-3 weeks. Keep humidity 75 percent or above, mist 2-3 times a day. Keep them in a bag or container. Mist the container, not the mushrooms. (Keep them dry.) It's ready to transplant or harvest in about 3 weeks. They'll start to release spores around this time, and the mushroom spikes will grow longer, looking like a lion's mane (hence the name).

How Long It Takes

Produces mushrooms in 2-3 weeks.

Care/Best Growing Conditions

Sun: 8-10 hours indirect sun.
Temperature: 60-70F.
Water: Mist 2-3, keep in moist bag.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest lion's mane after 2-3 weeks. Slice and use to make tinctures or infusions. You can also dry them for longterm storage. Dry for 1-2 weeks. You can also use a dehydrator.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Shows potent ability to help repair nerve tissue in the brain, boosting memory and concentration. Also shows a lot of potential to help with sleep, anxiety, and ADHD. Also shows potential with managing blood sugar and high blood pressure.

Tincture: Two step process. Make regular alcohol tincture, 4-6 weeks. Cover remaining mushrooms with water, 2-4 hours. Let cool, then combine with alcohol tincture in a 2:1 alcohol to water ratio.

Tincture Dosage: 30-60 drops, 3x per day.

Hot Infusion: 1-2 teaspoons dried mushrooms or powder in 8 oz, steep 15-20 minutes

Hot Infusion Dosage: 1 cup 2-3x per day.

Cautions & Notes: Extended use at high doses can interfere with blood clotting, blood pressure, and diabetes medications. Can also interfere with meds for autoimmune disorders and immunosuppressants. Strain infusions and tinctures an extra time through cheesecloth or a coffee filter to remove fuzz/hairs that irritate the throat.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .471	1 quart = .951
	1 gallon = 3.81

Lomatium

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Very difficult to start from seed. Better to transplant and let it grow on its own. For seeds, direct sow in late fall for a spring start.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Start by storing in wet sandy bag in the fridge for 60-90 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-30 inches.
By square foot: 1 per foot.

How Long It Takes

Several years (3+) for roots.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-75F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest lomatium roots in the fall or winter. Dig them up, cut them, and dry them for longterm storage. Works best with a dehydrator.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Strong antiviral properties against Influenza A and B, SARS, Covid, pneumonia.

Root Tincture: Make with 1:2 ratio, 30 percent water. 2 weeks. Dry Root Tincture: Make with 1:5 ratio, 30 percent water. 2 weeks.

Tincture Dosage: 10-20 drops every 2-3 hours.

Hot Infusion: 1 teaspoon in 6 oz of water, steep 1 hour. Keep covered.

Hot Infusion Dosage: 2-3 oz, 2-3x per day.

Cautions & Notes: In 5-10 percent of people, an alarming rash can erupt and cover the entire body during the first week. It doesn't represent a threat and resolves on its own. Fever can also occur. It's very difficult to start from seed. Roots need to be old, bitter, and oily to generate antiviral properties. Once established, tolerates a range of conditions from mid 90s F down to negative temperatures. For serious infections, combine lomatium tincture with red root, licorice, and pleurisy tinctures. Make a batch of 16 oz equal parts and take 1 teaspoon 6x per day. You can also use steam from lomatium infusions, like a humidifier mix.

Mullein

Pollination: Self/Insect
Lifespan: Biennial

When to Plant

Best to direct sow in late winter. Indoors, start seedlings 6-8 weeks before last frost. Consider soaking in wet sandy bag for 30-60 days.

How to Plant

Plant seeds 1/8 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 18-24 inches.
Between rows: 24-36 inches.
By square foot: 1 per square foot.

How Long It Takes

Spring for leaves, second year for the rest.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest mullein leaves during late spring. Harvest flowers during the second summer, and roots during the first fall or second early spring for the most potency. If storing longterm, dry 2-3 weeks.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Shows some antimicrobial potential against Influenza and pneumonia. Can also be used as poultice (wet heap) on rashes, burns, and wounds. Infusions can help restore lung health and help with joint/muscle pain.

Leaf Tincture: Make with 1:2 ratio for fresh, 1:5 for dried. 6-8 weeks.

Root Tincture: Make with 1:2 ratio for fresh, 1:5 for dried. 6-8 weeks.

Tincture Dosage: 40-50 drops, 3x per day.

Hot Infusion: 1 oz in 1 pint, simmered 15 minutes and steeped 4-8 hours.

Hot Infusion Dosage: 1 cup 2-3x per day.

Cautions & Notes: Seeds are considered potentially toxic. Strain infusions and tinctures an extra time through cheesecloth or a coffee filter to remove fuzz/hairs that irritate the throat.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .471	1 quart = .951
	1 gallon = 3.81

Oregon Grape Root

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Best to plant from 6-inch root divisions.
Start seedlings 6-10 weeks before last frost.
Stratify for 30-120 days first.

How to Plant

Plant seeds 1/2-1 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 3-4 days.
Outdoors: Plant in late fall and let germinate over winter. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 36-48 inches.
Between rows: 48-72 inches.
By square foot: 1 per 1-2 square foot.

How Long It Takes

Produces food in 90-150 days (3-5 months).

Care/Best Growing Conditions

Sun: 6-8 hours full sun, partial shade.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 5.5-6.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest Oregon grape root in the middle or late fall, when the leaves die back. Dig up with a fork. Dry 1-2 weeks for longterm storage. You can also use a dehydrator.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Shows some antimicrobial properties. Also used to treat skin irritations and conditions. Can also lower blood sugar.

Salve: 1 cup, or pack one jar, cover with olive oil or something similar, infuse 4-6 weeks. Add 1 oz of beeswax.

Root Tincture: Make with 1:2 ratio for fresh root, 1:5 for dry.

Tincture Dosage: 30-60 drops, 2-3x per day.

Hot Infusion: 1-2 teaspoons dried root in 1 cup, steep 15 minutes. Keep covered.

Hot Infusion Dosage: 1 cup, 2-3x per day.

Cautions & Notes: Poses risk to anyone with liver and kidney problems. Tolerates extreme temperatures very well, down to negative digits and up to triple digits. The bark and underground stems also show many of the same medicinal properties and can be used along with the root.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .471	1 quart = .951
	1 gallon = 3.81

Pink-Striped Trumpet Lily

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

It's best to plant bulbs in early spring or fall. If starting from seed, plant 8-10 weeks before last frost.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Supplement sun with grow light as needed. Transfer after 8-10 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-24 inches.
By square foot: 2-3 per square foot.

How Long It Takes

Leaves ready to harvest within 60 days.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-75F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest trumpet lily leaves when the plant produces 15-30. It's best to let the plant grow into its second season. Harvest up to 1/3 of the plant so it can regrow. Fresh or slightly yellow leaves in summer or fall are best for medicine.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Used as a poultice to help heal wounds and bites from snakes/poisonous insects. Ointments used for rashes and burns. Teas can help with general pain and cramps. Also aids prostate health.

Poultice: Apply leaves directly to wounds or rashes. You can also chop or grind them into a mash. Can heat first.

Hot Infusion: 1-2 tablespoons of leaves and flower petals in 8 oz of water, steep 15 minutes.

Cautions & Notes: Can raise your heart rate and elevate your temperature. Some people experience hallucinations. The bulb is toxic. While the plant can be used for tinctures and teas, it's best to only use the leaves to treat external wounds and injuries.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .471	1 quart = .951
	1 gallon = 3.81

Pleurisy Root

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

Start seedlings 3-4 weeks before last frost. Good idea to stratify 2-4 weeks first.

How to Plant

Plant seeds 1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-24 inches.
Between rows: 24-36 inches.
By square foot: 1 per 1-2 square foot.

How Long It Takes

Ready to harvest fall of second year.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 65-75F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest pleurisy root the fall of the second year, after the leaves have died back. Dig up with a fork. Dry 1-2 weeks for longterm storage.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Helps fight infections and ease symptoms. Can also treat fevers, cramps, and stomach problems.

Root Tincture: Make with 1:2 ratio for fresh root, 1:5 for dry.

Tincture Dosage: 20-40 drops, 3x per day.

Hot Infusion: 1 teaspoon dried root in 1 pint, simmer 15 minutes. Keep covered.

Hot Infusion Dosage: 1 cup, 2x per day

Cautions & Notes: High doses can lead to heart problems. Can interact with heart medications. Can also cause nausea and vomiting. Works like estrogen, and can make estrogen supplements less effective. Especially avoid if you're pregnant or breastfeeding.

1 teaspoon = 4.9ml
1 oz = 29.57ml
1 pint = .471
1 tablespoon = 14.78ml
1 cup = 240ml
1 quart = .951
1 gallon = 3.81

Pokeweed

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

It's best to direct sow in winter for spring growing. Otherwise, stratify for 1-3 months. Start 6-8 weeks before last frost.

How to Plant

Plant seeds 1/2 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-8 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 18-36 inches.
Between rows: 36-48 inches.
By square foot: 1 per 1-2 square foot.

How Long It Takes

Roots ready to harvest in fall.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 4.7-8
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest pokeweed root in the fall, after leaves have died back. Dig up with fork. Dry for 1 week. You can also use a dehydrator.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Originally used to treat swollen lymph nodes, arthritis, and skin irritations. Also shows antiviral properties. Roots most used part, but sometimes berries.

Pokeweed Salve: Douse pokeweed in olive oil or something similar and infuse for 4-6 weeks. Strain out root. Use 1/2 cup with 2 tablespoons beeswax and shea butter.

Cautions & Notes: Pokeweed is highly toxic, even lethal, so don't use it unless you feel extremely comfortable with the instructions. Use externally. Don't drink. Don't consume.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .47l	1 quart = .95l
	1 gallon = 3.8l

Red Root

Pollination: Self/Insect
Lifespan: Perennial

When to Plant

It's best to direct sow in late winter. Indoors, start seedlings 6-8 weeks before last frost. Refrigerate in wet, sandy bag for 30-60 days.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: After chilling, plant 2-3 seeds per plug. Thin after sprouting. Supplement sun with grow light as needed. Transfer after 3-4 weeks. Harden off for 3-4 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-36 inches.
By square foot: 1 per foot.

How Long It Takes

Roots ready during second late fall.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest red root during late fall or early winter, after a frost or two. The frost activates antiviral and medicinal properties, turning the root red and pink. Dig up with a fork. Dry 5-10 days if storing long term.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Broad antiviral properties. Used by indigenous North Americans to treat infections, pneumonia, digestive problems, aches, and urinary tract infections. Also shown to help reduce blood pressure and blood sugar levels.

Fresh Root Tincture: Make with 1:2 ratio. Dry Root Tincture: Make with 1:5 ratio.

Tincture Dosage: 30-90 drops, 4x a day.

Tea: 1 teaspoon powdered root in 8 oz of water, brew 15 minutes.

Tea Dosage: 2-6 cups per day.

Decoction: 1 oz root in 16 oz water, simmer 30 minutes.

Decoction Dosage: 3-4 oz, 3-4x per day.

Cautions & Notes: Can interfere with meds for high blood pressure and diabetes. Cut, chop, and crush when it's fresh before it dries and hardens. Red root can interfere with blood clotting. It has effects similar to blood thinners.

1 teaspoon = 4.9ml	1 tablespoon = 14.78ml
1 oz = 29.57ml	1 cup = 240ml
1 pint = .47l	1 quart = .95l
	1 gallon = 3.8l

Rhodiola

Pollination: Self
Lifespan: Perennial

When to Plant

You can start from root crowns. From seed, best to direct sow in late fall. Indoors, start seedlings 6-8 weeks before last frost. Stratify 4-6 weeks first.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: After chilling, plant 2-3 seeds per plug. Thin after sprouting. Supplement sun with grow light as needed. Transfer after 4-6 weeks. Harden off for 3-4 days.
Outdoors: Plant in late fall. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-36 inches.
By square foot: 1 per foot.

How Long It Takes

Roots ready to harvest in 4-5 years.

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 70-90F.
Water: 1-2 inches per week.
Soil pH: 6-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest during the fall of the 4th or 5th year. Dig up with a fork.

Collecting Seeds

See general instructions for collecting seeds.



Medicinal Information

Facts: Helps with stress management. Improves mental focus and concentration. Also increases energy and physical performance.

Root Tincture: Make with 1:2 ratio for fresh root, make with 1:5 ratio for dry.

Tincture Dosage: 15-30 drops, 3-4x a day.

Hot Infusion: 1 tablespoon dry root in 1 cup. Steep 10-15 minutes.

Hot Infusion Dosage: 1 cup, 1-3x per day.

Cautions & Notes: Rhodiola root has potent effects on energy levels, so herbalists recommend taking it earlier in the day to avoid disrupting sleep. If you're a night owl, then just know that it's going to keep you up.

1 teaspoon = 4.9ml
1 tablespoon = 14.78ml
1 oz = 29.57ml
1 cup = 240ml
1 pint = .471
1 quart = .951
1 gallon = 3.81

Yarrow

Pollination: Insect
Lifespan: Perennial



When to Plant

Start seedlings 6-10 weeks before last frost. Stratifying recommended.

How to Plant

Plant seeds 1/8-1/4 inch deep
Indoors: 2-3 seeds per plug. Thin after sprouting. Can start them in a cold frame/small greenhouse. Supplement sun with grow light as needed. Transfer after 6-10 weeks. Harden off for 7-10 days.
Outdoors: Plant right after last frost. 2-3 seeds per 12 square inches. Thin after sprouting.
Between plants: 12-18 inches.
Between rows: 18-24 inches.
By square foot: 1 per square foot.

How Long It Takes

Produces in 120-130 days (4 months).

Care/Best Growing Conditions

Sun: 8-10 hours full sun.
Temperature: 60-75F.
Water: 1-2 inches per week.
Soil pH: 5.5-7.5
Common pests: Aphids, flea beetles, loopers, cutworms, slugs, snails, whiteflies, harlequin bugs, thrips

Harvesting

Harvest yarrow in mid summer during full flowering. Harvest 1/3 of the plant to allow for regrowth. If storing long term, dry for 1-2 weeks.

Collecting Seeds

See general instructions for collecting seeds.

Medicinal Information

Facts: Known for helping to stop bleeding and healing wounds. Also antimicrobial, almost like nature's baind-aid. Tinctures and hot infusions help with menstrual pain and indigestion. Can also help with high blood pressure and thrombosis. Many herbalists also testify to its use as an antiviral and cold remedy.

Leaf poultice: Apply leaves directly to wounds or chop/crush and apply.

Leaf Tincture: Use 1:2 ratio for fresh, 1:5 for dry. 4-6 weeks.

Tincture Dosage: 10-20 drops, 3x per day.

Hot Infusion: 1-2 teaspoons in 1 cup, steep 15 minutes.

Hot Infusion Dosage: 1 cup, 3x per day.

Cautions & Notes: Can interfere with meds for high blood pressure and diabetes. Although herbalists caution against herb use during pregnancy, this one in particular can cause problems.

1 teaspoon = 4.9ml
1 oz = 29.57ml
1 pint = .471
1 tablespoon = 14.78ml
1 cup = 240ml
1 quart = .951
1 gallon = 3.81

Weed Herbs

Burdock

Facts: Broad antimicrobial properties. Used to treat joint pain and liver problems. Also shows potential to help manage arthritis and diabetes.

Root Tincture: Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 20-30 drops, 2-4x per day.

Hot Infusion: 1-2 tablespoons dried root in 2-3 cups water. Simmer 10-15 minutes. For stronger infusion, 2-3 tablespoons dried root in 4 cups water. Boil. Steep 4-6 hours.

Hot Infusion Dosage: 1-2 cups, 3-4x per day.

Chickweed

Facts: Used to help with skin problems, rashes, bug bites, burns. Also promotes wound healing. Also shows potential to help with joint pain and arthritis.

All Purpose Tincture: Use equal parts stems, leaves, flowers. Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 30-60 drops, 1-3x per day.

Poultice: Chop or crush leaves. Mix with olive or oil something similar. Mix into thick paste. Apply directly to area that needs treatment.

Dandelion

Facts: Helps with stomach problems and supports liver health. Also shows potential to help manage high blood pressure and inhibit cancer cell growth.

All Purpose Tincture: Use equal parts roots, leaves, and flowers. Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 30-60 drops, 1-3x per day.

Hot Infusion: Use equal parts roots, leaves, and flowers. 1 cup flower parts in 1 cup water. Boil then steep 10-20 minutes.

Hot Infusion Dosage: 1 cup, 2-3x per day.

Japanese Knotweed

Facts: Somewhat strong antimicrobial properties. Also used to treat Lyme Disease, supporting nervous system and improving blood flow.

Tincture: Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 30-60 drops, 1-3x per day.

Hot Infusion: 1 oz dried root in 2 cups water. Simmer 10-15 minutes.

Hot Infusion Dosage: 1 cup, 3-4x per day.

Jewelweed

Facts: Used to treat skin irritations as well as poison ivy, poison oak, and rashes. Also used to treat insect bites and stings, as well as sunburn.

Poultice: Chop or crush leaves. Mix with olive oil or something similar. Mix into thick paste. Apply directly to area that needs treatment.

Notes: Herbalists mainly used jewelweed externally now to treat skin irritations and injuries. Although it's edible, consuming too much in high concentrations like tinctures and infusions can cause vomiting or stomach problems.

Kudzu

Facts: Known for promoting moderate alcohol consumption. Also promotes cardiovascular and neural health. Shows potential to relieve menopausal symptoms.

Root Tincture: Make with 1:2 ratio for fresh, 1:5 for dried. 6-8 weeks.

Tincture Dosage: 30-60 drops, 1-3x per day.

Hot Infusion: 1 tablespoon dried root in 1 cup water. Heat (don't boil), 2-5 minutes while stirring continuously. Will turn thick and dark.

Hot Infusion Dosage: 1 cup, 2-3x per day.

Lambsquarter

Facts: Used to treat skin irritations, sunburns, insect bites, scrapes. Can also help with stomach problems.

Tincture: Use equal parts leaves and flowers. Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 20-30 drops, 1-3x per day.

Poultice: Chop or crush leaves. Mix with olive oil or something similar. Mix into thick paste. Apply directly to area that needs treatment.

Stinging Nettle

Facts: Helps with allergy problems. Also used to treat joint pain and urinary tract infections. Also shows potential to help manage high blood pressure.

Leaf Tincture: Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 30-60 drops, 1-3x per day.

Hot Infusion: Use leaves. 1 cup in 1 quarter. Boil, steep 4-8 hours.

Hot Infusion Dosage: 1 cup, 2-4x per day.

Pineappleweed

Facts: Helps with stomach aches and cramps. Used to treat skin irritation and burns. Also used as a mild sedative to promote sleep.

Tincture: Use flower heads. Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 30-90 drops, 1-3x per day.

Poultice: Chop or crush leaves. Mix with olive oil or something similar. Mix into thick paste. Apply directly to area that needs treatment.

Plantago (Plantain)

Facts: Offers immune system support. Used to treat insect bites, stings, as well as burns and cuts. Also shows potential to help regulate blood sugar.

Tincture: Use leaves. Make with 1:2 ratio for fresh, 1:5 for dried. 4-6 weeks.

Tincture Dosage: 10-15 drops, 1-3x per day.

Poultice: Chop or crush leaves. Mix with olive oil or something similar. Mix into thick paste. Apply directly to area that needs treatment.

How to Mend Clothes

Knowing how to mend and repair clothes gives you a considerable advantage in a longterm emergency. Not only does it help items last longer, it also gives you a skill to trade. If you're not great at sewing, it makes sense to round up one or even several guides. You can find plenty of old, out-of-print books on sewing in open libraries. This guide is presenting excerpts that cover some of the most common mending methods.

Many mending procedures can be quickly and easily done by hand. Although a sewing machine is a definite time-saver on many projects, it's absolutely necessary for only a few. Once you've mastered the basics of hand sewing, you'll be able to handle nearly all of the most common repairs.

Mastery of hand sewing involves more than knowing where to push the needle in and where it pull it out; you should know which thread to use, how long to cut it, and when and how to knot it, among other things. The instructions given below will help you get started correctly.

Which Needle & Thread?

General purpose thread is suitable for nearly all mending jobs. Use heavy-duty thread only for extra-heavy jobs, such as sewing on coat buttons, or where a heavier thread has already been used for a decorative purpose, such as coat and jacket buttonholes or topstitching. Match the fabric color as closely as possible, and remember: A thread that looks a shade or two darker on the spool will match the fabric better than one that looks the same shade.

Use the finest needle that has an eye big enough to accommodate the thread easily. A short needle is best used for short, single stitches, as in backstitching; a longer needle is appropriate for longer stitches or for when you take several stitches on the needle at one time, for example, when you baste or do the running stitch.

Cutting the Thread

Always use scissors to cut thread from a spool. Don't bite it off with your teeth or break it; this leaves a ragged end that is difficult to thread through the eye of the needle. Hold the scissors at a sharp angle when cutting so the thread has a pointed end for easy threading.

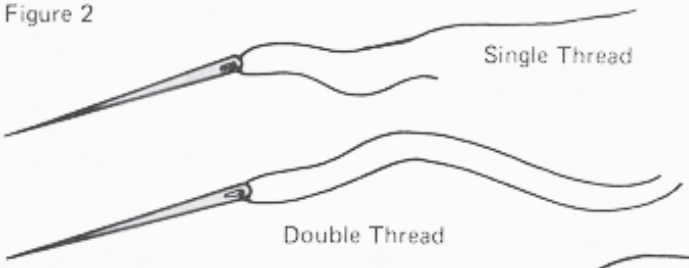
Most mending projects require a single thread; some, sewing on buttons for example, require the strength of a double thread. Which you should use will be noted in each project. If you are using a single thread, cut it 16 to 20 inches (40.5 to 51 cm) long; cut a double thread 24 to 30 inches (61 to 75 cm) long so that when it is doubled it is only 12 to 15 inches (30 to 37 cm) long.

Threading the Needle

Holding the needle upright with one hand, rotate it in your fingers until you can see the eye. Hold the cut thread about ¾ inch (20 mm) from the end with the fingers of the other hand and push the thread through the eye of the needle until about ½ inch (13 mm) extends beyond the eye *(fig. 1)*. If you have trouble, try positioning the needle in front of a white surface so the eye is more visible, or stiffen the thread end by moistening it or running it through some beeswax. You can also try a needle with a larger eye or use a needle threader.

Pull the thread through the eye of the needle. Pull one-third (about 5 to 7 inches or 12 to 18 cm) the thread length through for a single thread. Match the ends if a double thread is needed for the mending job *(fig. 2)*.

Figure 2



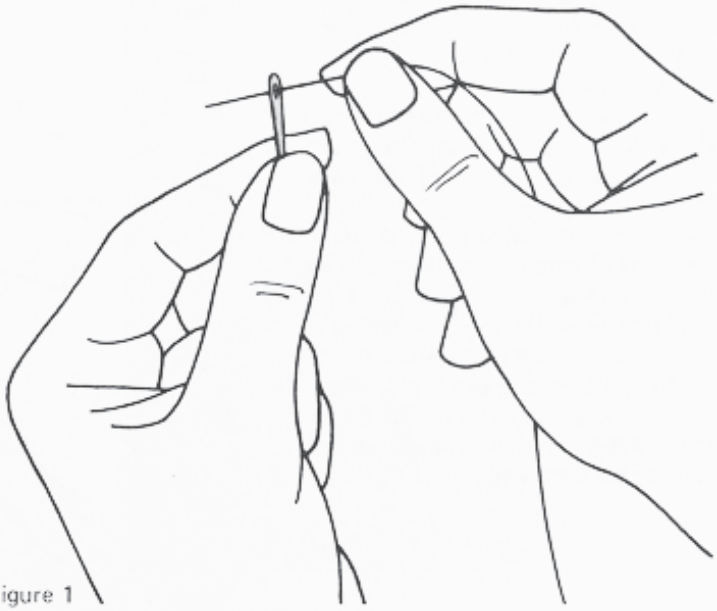


Figure 1

Knotting the Thread

For almost all hand sewing projects you will knot your thread before beginning to sew. The directions for each project will note whether you should knot the thread.

You can use the method illustrated here to make either large or small knots, depending on how many times you wrap the thread around the end of the needle. When you use a single thread or when you sew on lightweight fabrics, you need a small knot. Sewing with a double thread or on loosely woven or knit fabrics requires a larger knot. No knot, however, should be so large that it shows through, or creates a lump on the garment.

Place the end of the thread along the ball of the index finger of your left hand. Hold the thread with your left thumb and position the point of the needle over the thread about ½ inch (13 mm) from the end of the thread *(fig. 4)*.

Hold the end of the thread and the needle in place with the left thumb. With your right hand, wrap the thread snugly around the tip of the needle, twice for a small knot or four times for a large knot *(fig. 5)*.

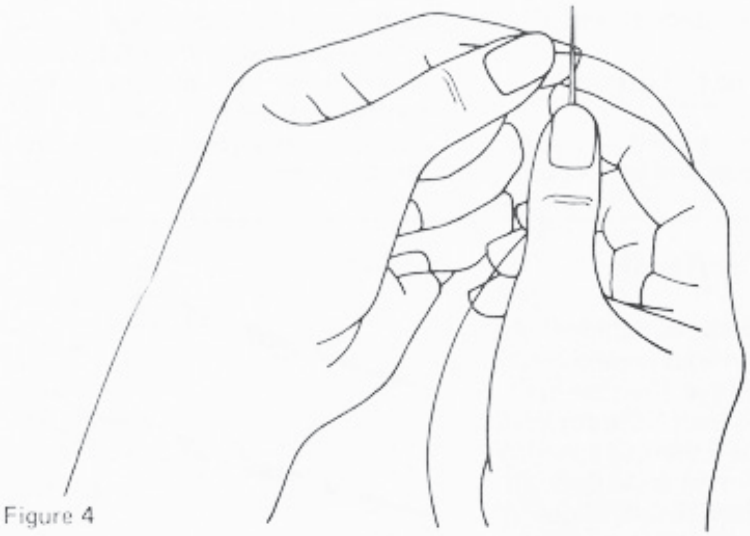


Figure 4



Figure 5

Pinch the wrapped thread between the thumb and index finger of the left hand. Push the needle up between those fingers as far as you can with the second finger of the right hand. Then, grasp the point of the needle with the thumb and index finger of the right hand and slide the wrapped thread slowly and smoothly down the needle, over the eye, and down the length of the thread into a snug knot *(fig. 6)*. Trim away the excess thread below the knot.

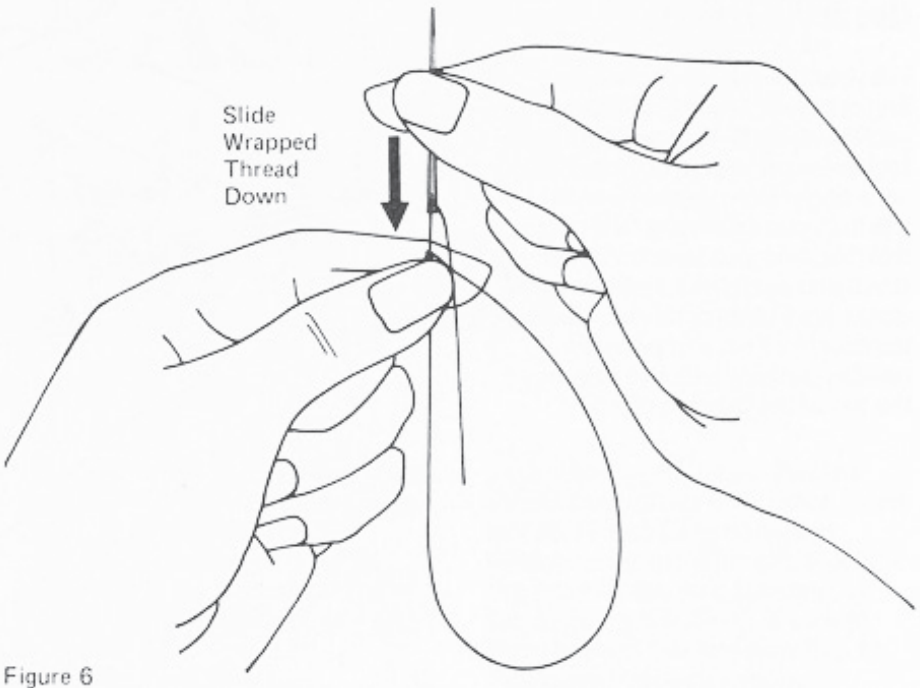


Figure 6

When Not to Knot

The knot at the end of the thread will hold it securely when you are starting a seam, beginning a hem, or replacing a button. The knot is meant to be placed out of sight between fabric layers or on the wrong side of the garment. Sometimes it's not possible to hide a knot. Use the following procedure instead:

Slip the needle between the fabric layers about ½ to 1 inch (13 to 25 mm) from where you want the stitching to begin *(fig. 7)*. Pull the thread very gently until the end is between the fabric layers. Hold the fabric layers between thumb and index finger, securing the thread end between them, and take a couple of very tiny backstitches (see Basic Hand Stitches) at your starting point, thus anchoring the thread permanently *(fig. 8)*.

At the end of your stitching, you will follow a similar procedure to secure your stitches and conceal your thread end. Take a couple of very tiny backstitches at the end of your line of stitching, then insert the needle between the fabric layers, bringing it out again about ½ to 1 inch (13 to 25 mm) away. Cut the thread very close to the fabric surface.

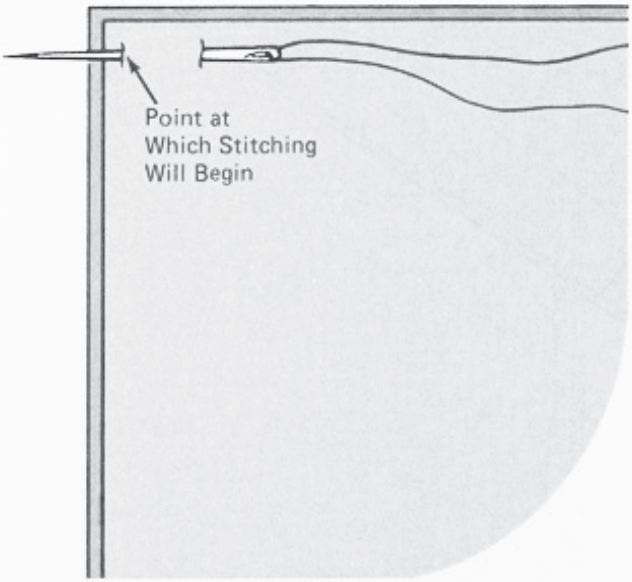


Figure 7

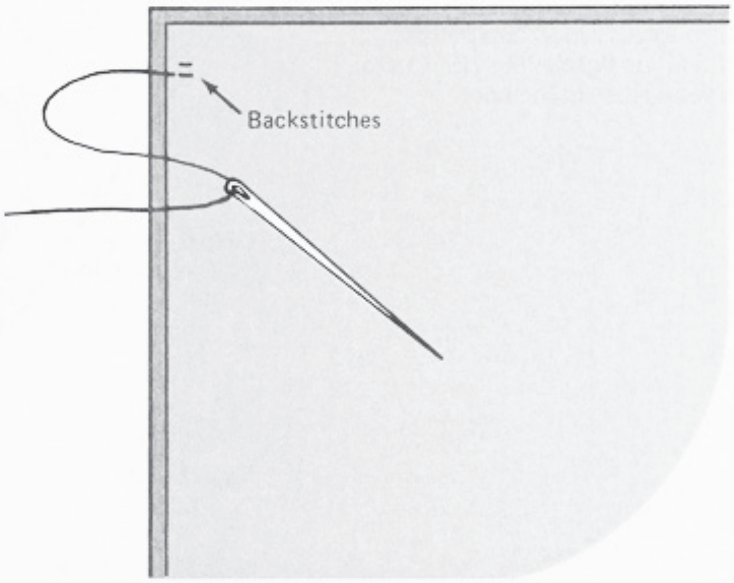


Figure 8

Use of the Thimble

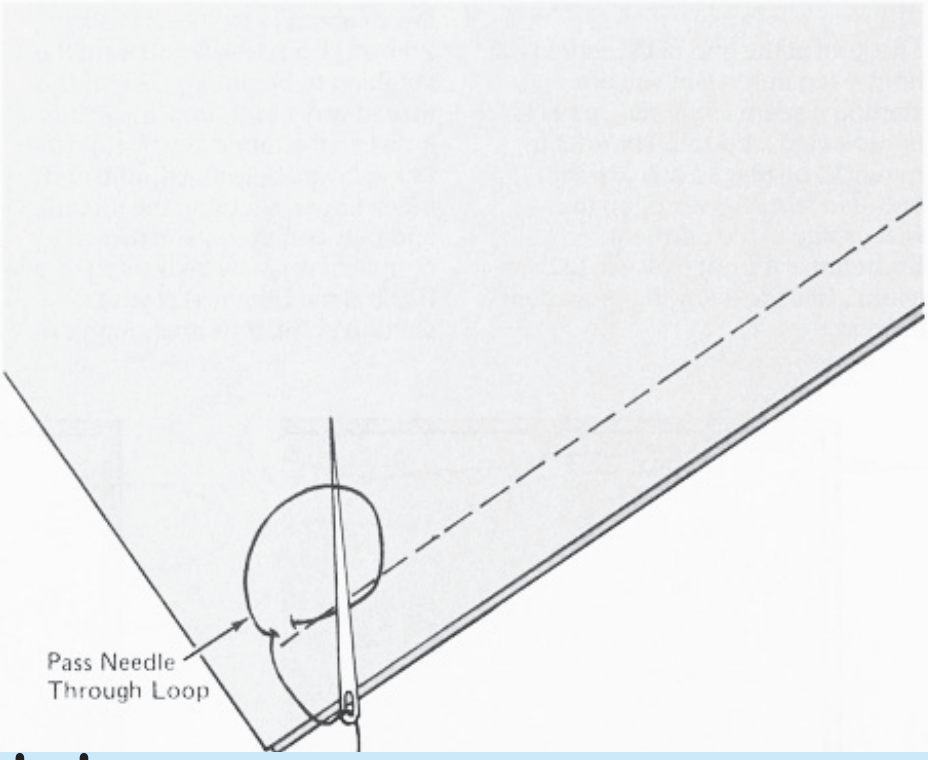
Put your thimble on the middle finger of your sewing hand when you are ready to start sewing. It will feel awkward at first, but it will keep your finger from getting sore and will help you sew faster. With the thimble, you give an extra thrust when you push the needle through dense and/or thick fabrics. Use the thimble to direct and push the needle, pushing with the side, not the top of the thimble *(fig. 9)*.



Figure 9

Fastening Your Stitches

When you come to the end of a seam or hem, or have finished sewing on a button, you must secure your stitches. Work on the wrong side so your fastening stitches won't show. Take a small backstitch (see Basic Hand Stitches) in the fabric and pull the thread up snugly. Take another backstitch at the same point and pull up the thread, leaving just a small loop. Insert the needle through this loop and pull the thread up tightly *(fig. 10)*. Cut the thread close to the knot.



Basic Hand Stitches

You'll use these four hand stitches over and over again in your mending. You'll find directions for other kinds of hand stitches in the text for different mending projects, but these four will carry you through many, if not most, repairs. If you haven't sewn before, you may want to practice these stitches to develop the ability to stitch evenly in a straight line.

Backstitch

The strong and versatile backstitch is the best alternative to a machine straight stitch. You'll use it to fasten off your work at both the beginning and end of a line of stitches and to repair all kinds of seams. The backstitch can also be used for topstitching, the decorative line of stitching on the right side of your garments.

Viewed from the top, backstitching appears as a continuous line of even stitches. Viewed underneath, the stitches are twice as long as those on top and they overlap at the ends. Use a single knotted thread. Work from right to left. Insert the needle from the underside of the fabric layers ⅛ inch (3 mm) to the left of where your stitching will begin. Pull the thread through up to the knot. Insert needle ⅛ inch (3 mm) behind where the thread emerges, that is, at the point where your stitching will begin. Bring needle up ¼ inch (6 mm) beyond this insertion *(fig. 1)*. Pull thread through snugly.

Insert needle through all layers ⅛ inch (3 mm) behind where it emerged, i.e., at the end of the previous stitch. Bring needle up ¼ inch (6 mm) beyond insertion, and pull thread through. Continue in this manner, forming evenly spaced stitches about ⅛ inch (3 mm) long *(fig. 2)*.

Figure 1

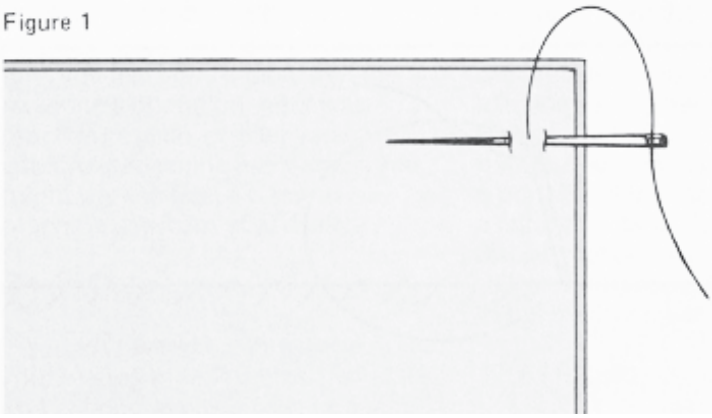
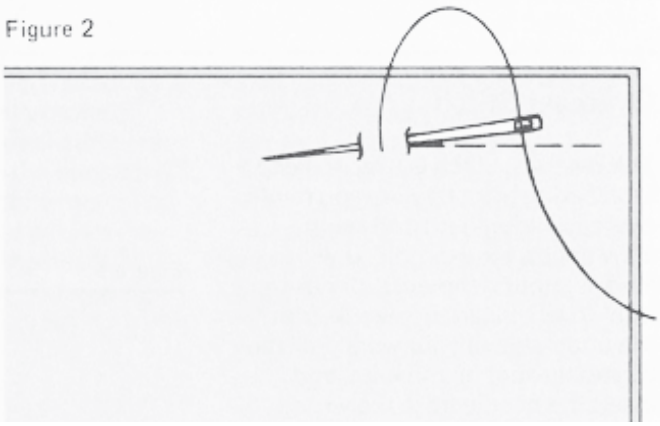


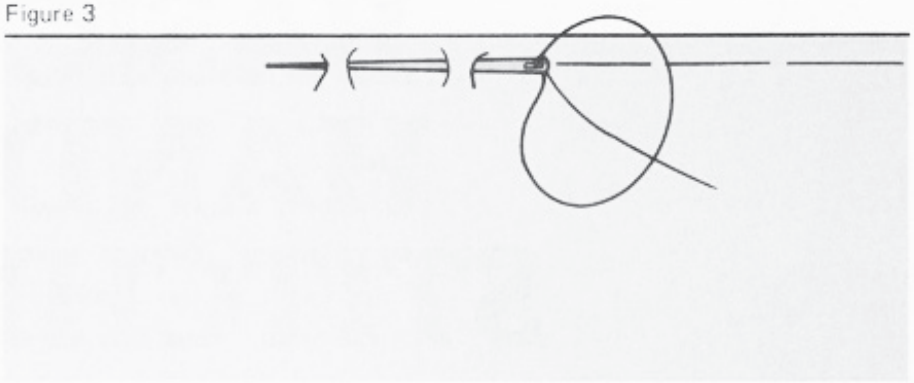
Figure 2



Basting

Basting is used to hold two or more layers of fabric together temporarily during fitting or construction. Because you will be pulling these threads out, you should use an unknotted, single thread. Work from right to left. Insert the needle from the right side, and weave the point in and out two or three times. Basting stitches may be as much as an inch long. Pull thread partially through, securing the unknotted end between thumb and index finger so that you don't pull it through entirely. Reinsert needle, and repeat process *(fig. 3)*. Do not backstitch at the end of your work, but leave the thread end loose so that the thread can be easily removed.

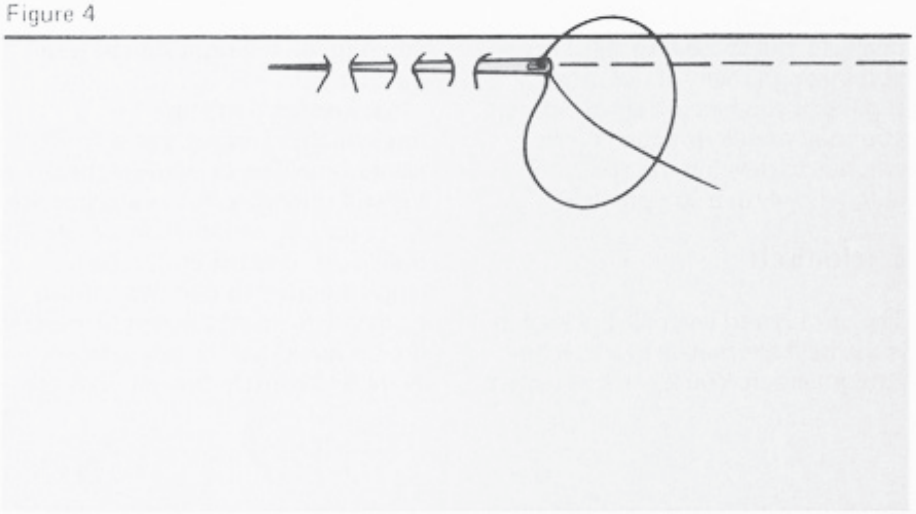
Figure 3



Running Stitch

The running stitch is used for delicate repairs, topstitching, and gathering. It is worked in much the same way as basting, but the stitches are shorter and even and because they are permanent, you secure the thread at both ends of the work. Use a single, knotted thread. Work from right to left. Insert the needle from the wrong side, then weave the point evenly in and out of the fabric two or three times *(fig. 4)*. Make small, even stitches. Pull the thread through firmly, but avoid puckering the fabric.

Figure 4



Overcast Stitch

The overcast stitch is used to keep a fabric edge from fraying; you might overcast along hem and seam allowances, for example. Use a single, knotted thread. Work from right to left. Insert the needle from the underside of your work. Pull the thread through to the knot, and insert the needle from the wrong side again, ⅛ to ¼ inch (3 to 6 mm) to the left of the knot *(fig. 5)*. Pull thread through again, but not too tightly, or the fabric edge will curl. The more your fabric frays, the closer together your stitches should be. Keep the depth of the stitches uniform, and make them as shallow as possible without pulling the

Figure 5

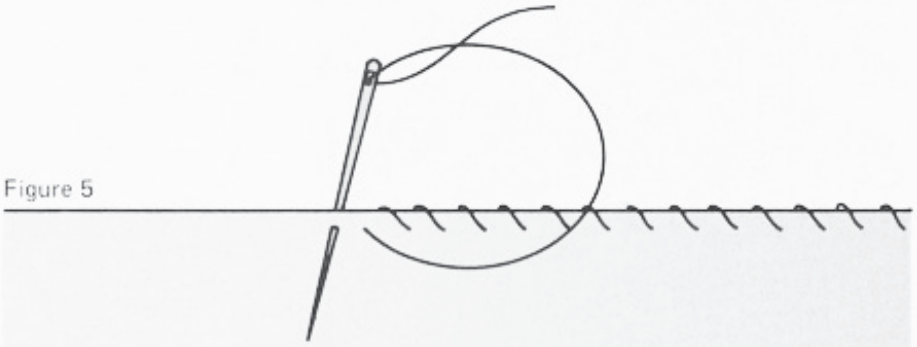


Figure 1

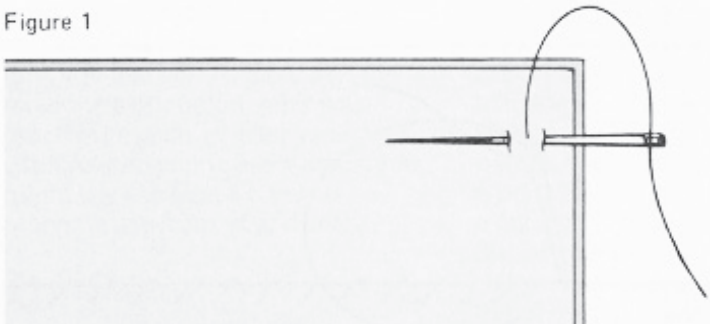
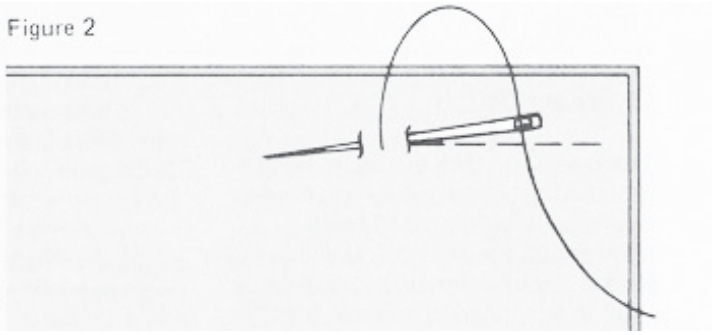


Figure 2



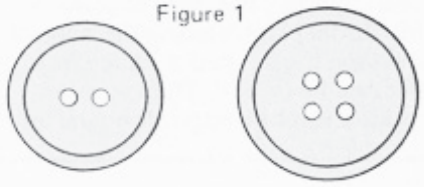
Repairing Buttons

A missing button can be a real nuisance, especially when it's missing from a very visible part of the garment. Help prevent this problem by occasionally checking your clothes to make sure the buttons are still secure. If any buttons are loose, cut them off and resew them immediately before you forget about them.

If a button does fall off, save it so you won't have to try to purchase a match. If you do lose the button, take the garment along when you shop for the replacement. The button chosen by the manufacturer complements the garment, fits the buttonhole accurately, and closes the garment properly. You're trying to match that selection in size, color, and style. It is sometimes difficult, and occasionally impossible, to find a perfect match. If you can't find a match, you will have to replace all the buttons on the garment with a new matching set. Make sure that the replacement buttons you buy can be cleaned in the same way the garment is cleaned; otherwise you'll have to remove and re-attach them each time the garment gets dirty.

There are basically two types of buttons: sew-through and shank *(fig. 1)*. Sew-through buttons have two or four holes through which the button is sewn onto the garment. Shank buttons have a small loop on the lower side through which they are sewn to the garment. Shank buttons are generally used on heavier fabrics and on outerwear. Don't switch from one type of button to another when choosing replacement buttons.

Figure 1



Sew-Through Buttons



Shank Buttons

Tip: Cut off the buttons from old garments before you discard them, and save them in a small jar. They can come in handy when you're trying to match or replace buttons on other garments.

Marking the Button Location

If the button was lost recently, there may still be some loose threads marking the button's location. Pull them out, using scissors or a seam ripper to cut tangled or knotted threads *(fig. 2)*. Sew the button on at the same spot. If there are no loose threads, you may be able to see some needle holes where the threads were, and you can use those for marking where the button belongs.

If there are neither loose threads nor needle holes to indicate where the button was, you'll have to mark the location by using the buttonholes. Button up all the buttons in line with the missing button; i.e., button up the shirt front buttons if that is where the button is missing. Make sure garment edges are aligned and the garment is lying flat. Put the point of your sharpened chalk pencil through the buttonhole and make a dot to determine button placement. If the buttonhole is horizontal, put the dot at the end of the buttonhole nearest the garment edge. If the buttonhole is vertical,

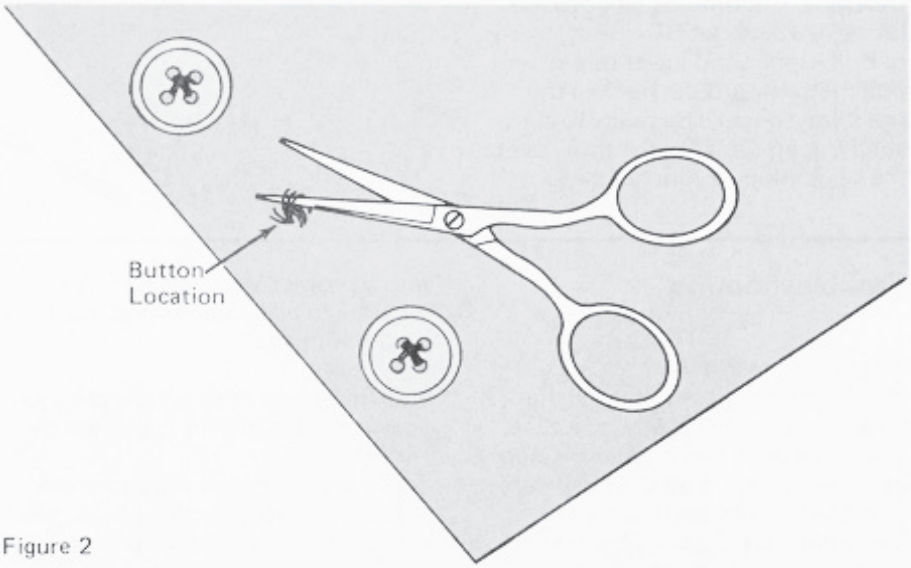


Figure 2

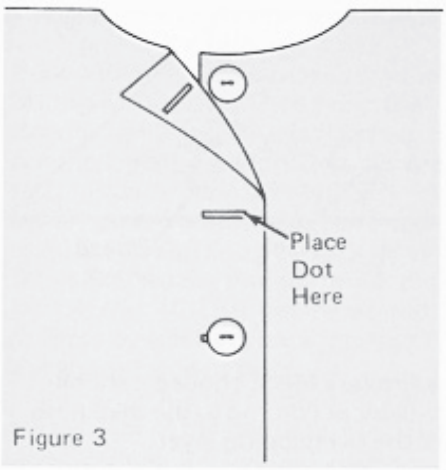


Figure 3

make the dot at the top of the buttonhole *(fig. 3)*. Place the marking for the button itself ⅛ inch (3 mm) away from the dot in the direction of the center of the buttonhole.

When the missing button stood alone, as on a one-button cuff or on a one-button jacket, and there are no thread or needle marks to guide you, there are two methods you can use to determine proper button placement. You can try on the garment, and mark the button

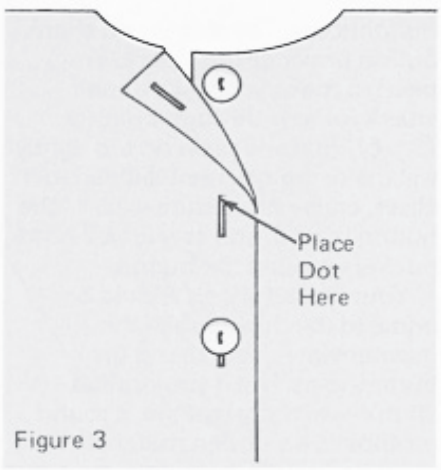


Figure 3

location through the buttonhole with a chalk pencil when the garment is held comfortably closed and properly aligned. A friend can be a great help in this procedure, especially if the button is in an awkward or hard-to-reach area. Remember to sew the button ⅛ inch (3 mm) away from the chalk dot toward the center of the buttonhole.

With some garments, a jacket for example, you can determine button placement by laying it on a work-



Figure 4

table, wrong sides together and closing edges aligned *(fig. 4)*. Mark the button location with a chalk pencil as described above.

Reinforcing the Fabric

Sometimes the fabric on which the button is sewn wears through or is ripped away. In such cases, you need to patch your garment before you sew the button back on. Consult the chapter on Holes & Tears for patching information.

If the fabric is worn along the entire button line, you can sew a long piece of cotton twill tape underneath the line before replacing the buttons *(fig. 5)*. Cotton twill tape is available at notions counters. Take off any remaining buttons. Pin the tape on the underside of the garment, centering it over the button line, and turning the cut ends under. Stitch it down, using a straight stitch on a sewing machine or a flat hem stitch (see Hems chapter) by hand. Then, replace the buttons.

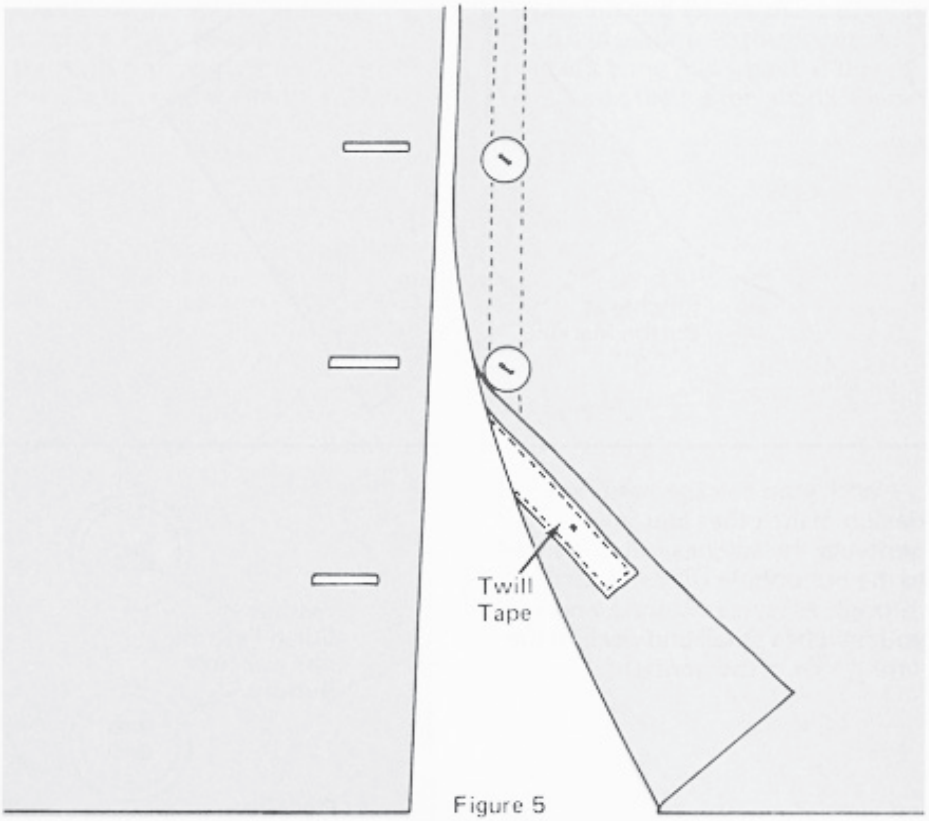


Figure 5

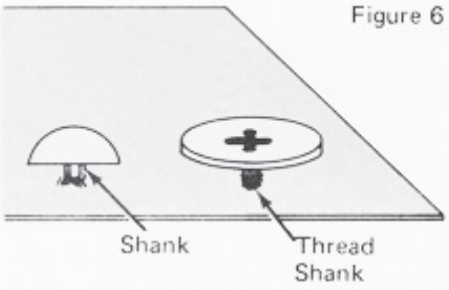
Sewing On Buttons

You can sew on most buttons with general purpose sewing thread. If you're sewing buttons on coats or heavy jackets, ask at your notions counter for heavy-duty or topstitching/buttonhole thread. Use a double, knotted thread, and be sure to run it through your beeswax to give it extra strength and keep it from tangling.

Buttons must be sewn on loosely enough to allow for the overlapping garment layer containing the buttonholes. The shank of a shank button provides this space. You need to make your own thread shank for sew-through buttons *(fig. 6)*. Buttons sewn on too tightly will make the garment difficult to close, cause premature wear of the button thread, and create pulls and puckers around the button.

Your thread shank should be equal to the thickness of the garment layer containing the buttonholes. Build your thread shank over a straight pin, a round toothpick, a wooden matchstick, or a similar object; choose a shank-builder according to the thickness of the overlapping layer.

Figure 6



Sew-through buttons. Insert the needle into the fabric on the side of the garment where the button will be, and bring the point up ⅛ inch (3 mm) away. Pull through to the knot. Take two small stitches at the marking for the button. This gives a firm base for your work; the button will cover the knot and stitches. Now insert the needle through one of the holes of the button from the wrong side of the button *(fig. 7)*. Let the button fall down the needle and the thread to the garment. Place your shank-builder across the top of the button; hold it in place with your finger and make your stitches over the shank-builder as you sew on the button *(fig. 8)*.

Figure 7

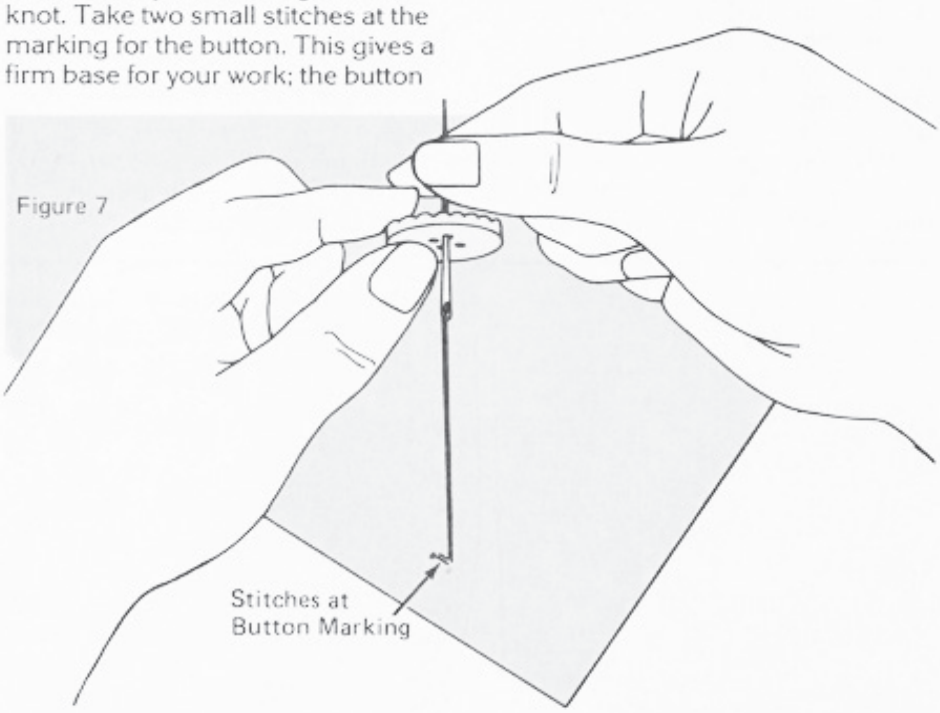
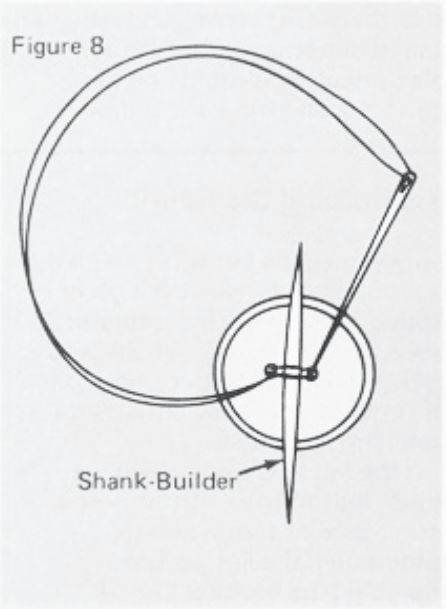


Figure 8



Match your stitches to the stitch design of the other buttons; generally the stitches will be parallel to the buttonhole *(fig. 9)*. Stitch through all layers of fabric, and keep your stitches small and neat on the wrong side of the garment.

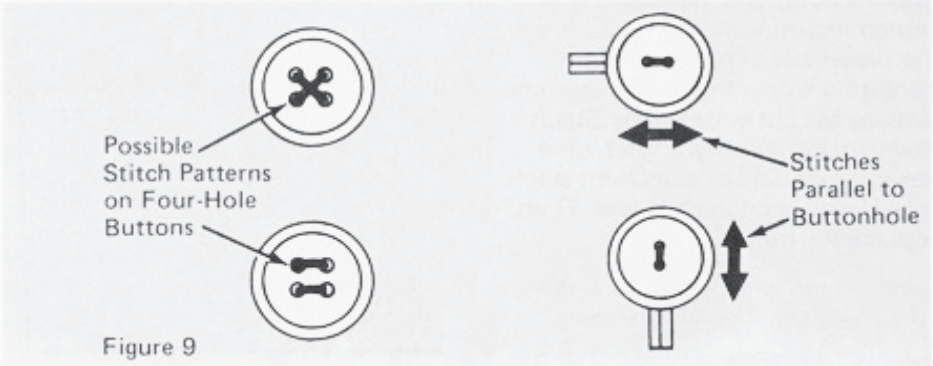


Figure 9

Take three to six stitches through each pair of the button's holes, depending on how much stress the button will receive. Then bring the needle up through the fabric, but not through the button. Remove the shank-builder, hold the button tightly away from the garment, and wind the thread snugly two or three times around the threads under the button *(fig. 10)*. Secure the wound threads by stitching back through the shank once or twice.

Insert the needle through to the wrong side of the garment. Push the needle under the button stitches. Pull thread partially through, forming a loop. Insert the needle through the loop, and pull the thread snugly to form a knot *(fig. 11)*. Cut the threads close to the knot.

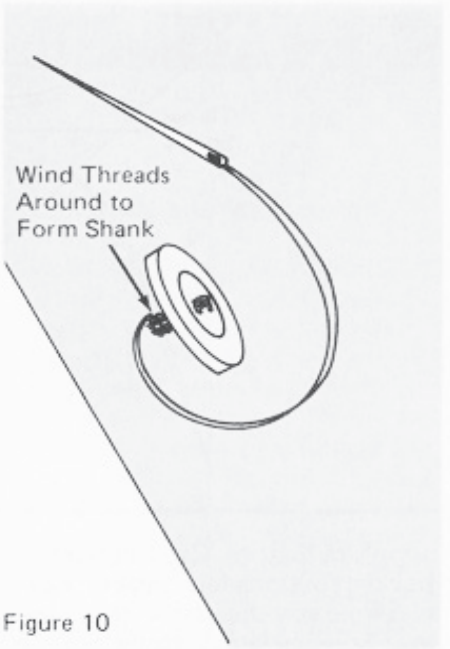


Figure 10

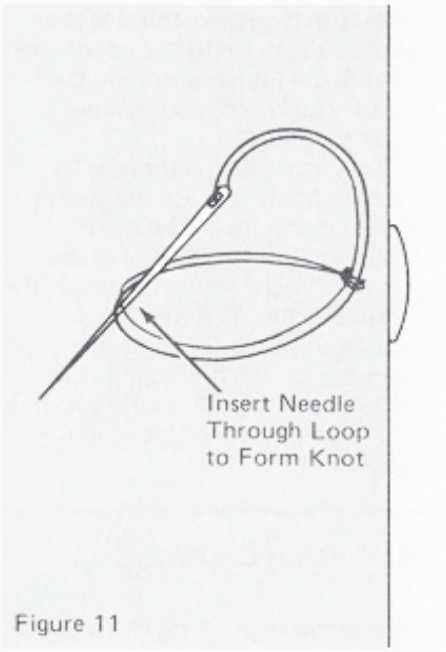
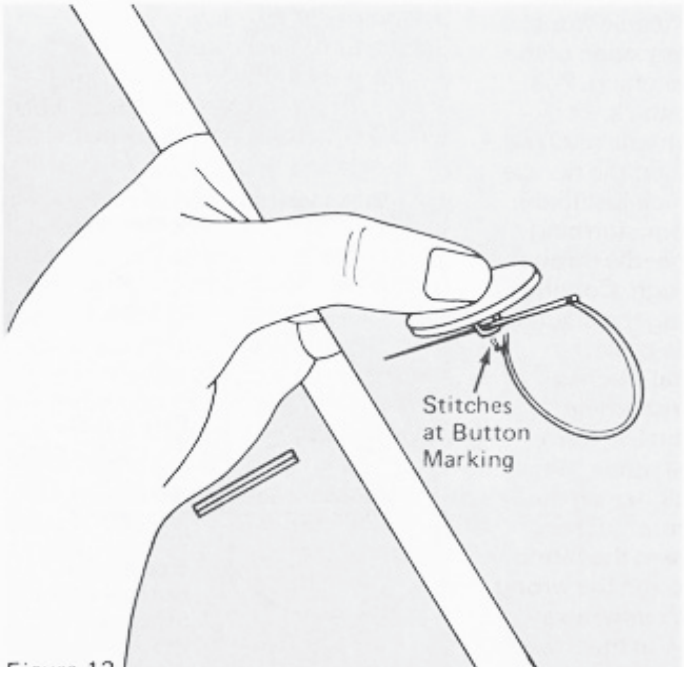


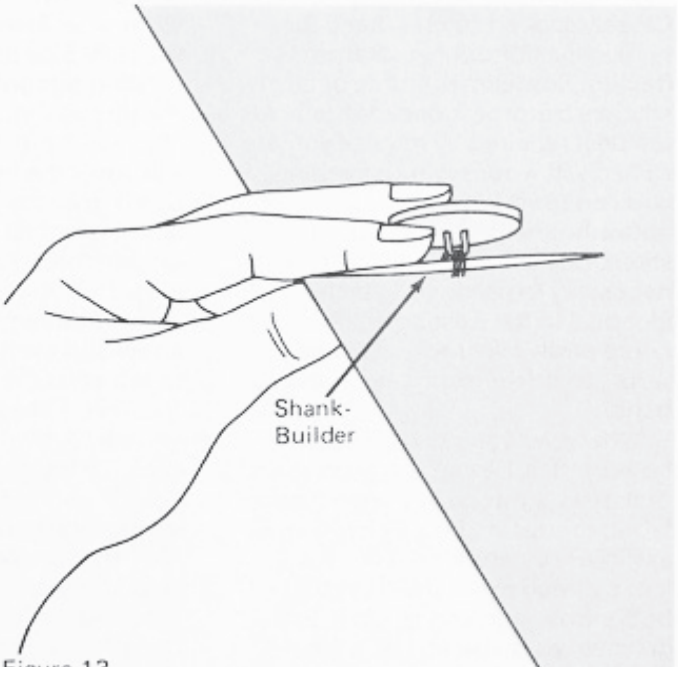
Figure 11

Shank buttons. Insert the needle on the side of the garment where the button will be. Bring needle up ⅛ inch (3 mm) away, and pull thread through to the knot. Take two small stitches at the button marking to give a firm base for your work *(fig. 12)*. The button will cover the knot and stitches. Position the button at the button marking with the shank parallel to the buttonhole. Insert the needle through the shank and then down through the fabric. Stitch through the shank four to eight times. Be careful to keep the stitches on the underside of the garment small and neat.

Finally, make a knot. On the wrong side of the garment, insert the needle under the button stitches. Pull thread partially through, forming a loop. Insert needle through the loop, and pull thread snugly to form a knot. Trim the threads close to the knot.

If you're sewing a shank button on very heavy fabric, you may need greater shank length. Therefore, sew the button on with a shank-builder. Place a toothpick or a matchstick between the bottom of the shank and the garment *(fig. 13)*. Hold it in place with the fingers of your left hand and work the thread over it and the button shank. Once

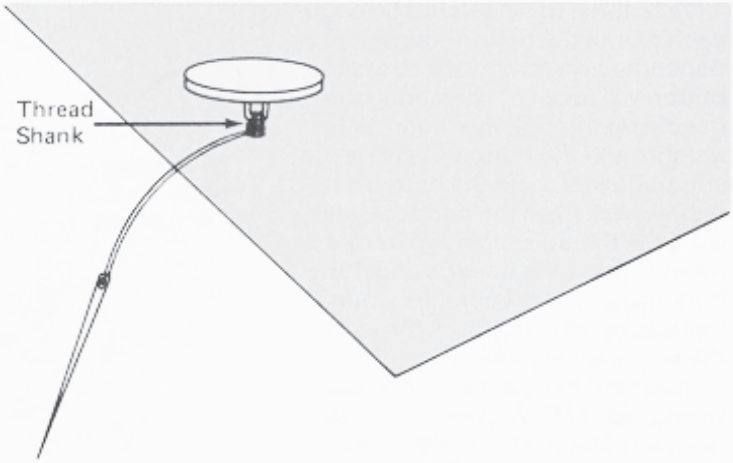




the button is secure, remove the shank-builder, bring the needle up through the fabric, and wind the thread snugly around the shank threads *(fig. 14)*.

Secure the wound threads by stitching back through the shank once or twice. Insert the needle through to the wrong side of the garment. Push the needle under the button stitches. Pull the thread partially through, forming a loop. Insert the needle through the loop, and pull the thread snugly to form a knot. Cut the threads close to the knot.

Figure 14



Reinforcing Buttons

Reinforcing or backing buttons are used on garments where extra strain is placed on buttons and on garments of heavy material. Backing buttons are small, flat buttons that are either transparent or of the same color as the garment. They make the button on the right side of the garment very secure and less likely to pull through the fabric. Buttons made for this purpose are available at stores that carry a good supply of buttons. Use two-hole backing buttons for shank type or two-hole sew-through buttons; use four-hole backing buttons for four-hole sew-through buttons.

Application is basically the same except that the backing button is placed under the button position on the wrong side of the garment *(fig. 15)*. Work through the backing button at the same time you are sewing the button in place.

Tip: *Check at your notions counter for new button ideas. New products are being introduced all the time which will allow you to attach or replace buttons without needle and thread. Some are for temporary use in emergencies; they'll hold the button on until you can sew it securely.*

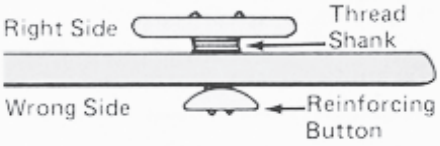


Figure 15

Repairing Buttonholes

Closely spaced stitches keep the edges of a buttonhole slit from fraying. Sometimes, some of these stitches become loose. Buttonholes are best repaired by hand. If you are skilled with your sewing machine, you can rework the edge of a buttonhole with a small zigzag stitch. However, the adjustments necessary to produce a stitch identical to the existing stitches could easily take more time than it would to do the complete repair by hand.

Whenever you need to repair buttonholes, be especially careful to match your thread to the garment fabric or existing buttonhole thread as closely as possible. Trim the loose thread ends of the existing buttonhole stitching as close to the garment as possible. Use a single, knotted thread. You will be working from right to left; start your work ⅛ inch (3 mm) to the right of the worn area. Insert the needle from the right side at the very edge of the existing buttonhole stitching. Pull the thread through to the knot *(fig. 16)*. Your subsequent stitching will cover the knot. Insert the needle again from the right side just to the left of your first insertion, forming a loop of thread. Pass needle through loop. Pull thread through. Continue in this manner, keeping the stitches small and even and as close together as the original stitches *(fig. 17)*. Extend your stitching ⅛ inch (3 mm) beyond the worn area. To fasten your stitches, take a couple of tiny backstitches on the wrong side of the garment. Then slide the needle between the fabric layers, bringing it through the wrong side about an inch (25 mm) away from the buttonhole. Cut the thread close to the garment so no end shows.

Figure 16

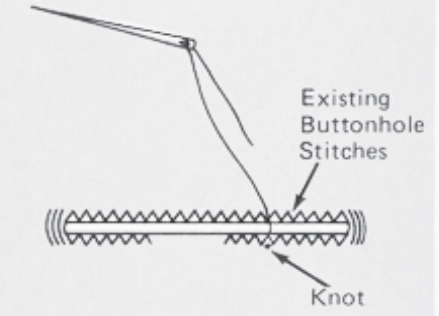
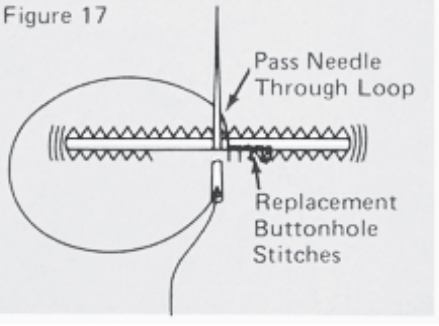


Figure 17



Repairing Holes & Tears

Holes and tears are among the most common mending problems. They are repaired by darning, using new threads to replace damaged or missing ones, or by patching, covering the damaged area with another layer of fabric. Evaluate a damaged garment carefully to determine how conspicuous a darn or patch will be. On some fabrics, particularly smooth, thin, light-colored fabrics, a darned or patched area will always show. Decorative patching can sometimes conceal a hole or tear. Holes or tears in your better clothes should be repaired by a person trained in reweaving. This technique will produce a nearly invisible repair, but it is a complicated process and requires special expertise.

Darning is used to mend holes or worn spots in fabric and to close tears, whether straight, diagonal, or L-shaped. Darning is most suitable for woven fabrics and relatively small areas. But it also works on fairly stable knits. If carefully done by hand, darning is almost invisible on certain fabrics. You can also darn by machine, which is much quicker and stronger than hand darning. Depending on the fabric, machine darning can also be quite inconspicuous.

Patching is preferred over darning for large damaged areas, garment areas that receive excessive strain, light-colored fabrics, printed and patterned fabrics, fabrics that fray easily, and knits. You can apply patches by machine or hand. If you have a machine, use it where especially strong patches are needed. Hand stitching works best on small patches and in tight places.

Preparation for Darning

Trim away any frayed threads from the hole or tear. This provides a clean work area and allows you to make a neater darn.

Select a thread that matches the fabric threads as closely as possible in color and size. General purpose thread is suitable for many fabrics; sheers require an extra-fine thread. Use darning cotton or embroidery floss to darn socks and woolens by hand. All these threads are available at most notions counters.

If darning by hand, use a darning needle of a size appropriate for your fabric and thread. A fine embroidery/crewel needle can be used for very lightweight fabrics. Both types of needles are available at notions counters in packages of assorted sizes.

See your machine instruction booklet for help in setting up your machine for darning. If there are no instructions for darning, do your repairs by hand. Darn holes by machine with a straight stitch. Support the damaged fabric in an embroidery hoop, and move it freehand under the machine needle as you mend. Because you use the embroidery hoop, this method is not suitable for darning tight areas. Machine-darn tears using a multi-step zigzag.

Whether you're working by hand or machine, you can support large holes and weak areas with a fabric backing to make a stronger repair. Use a firmly woven, lightweight fabric of a matching color. Cut it at least ½ inch (13 mm) larger all around than the area you are darning. Position the support fabric behind the damaged area on the wrong side of the garment. Fasten by hand basting, or use pins or your glue stick *(fig. 1)*.

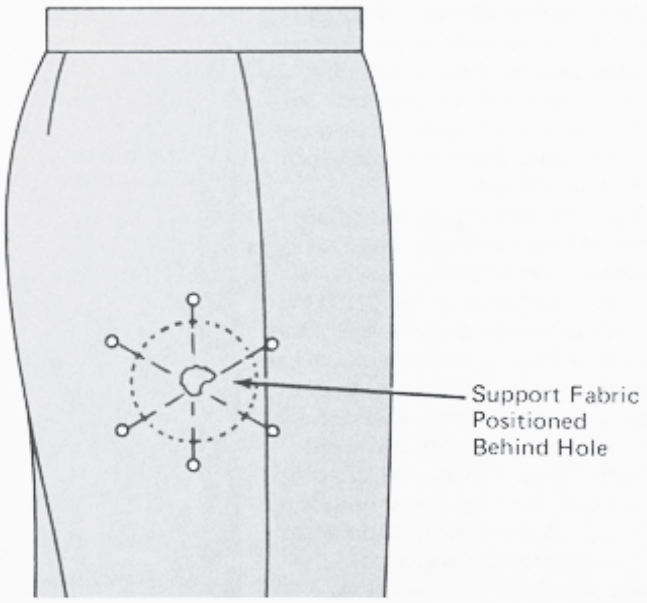


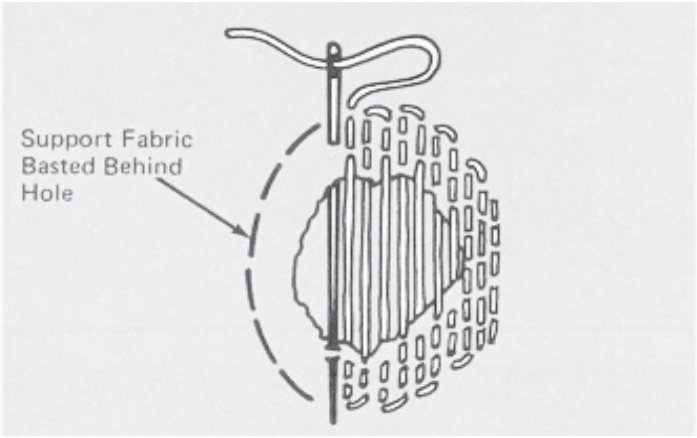
Figure 1

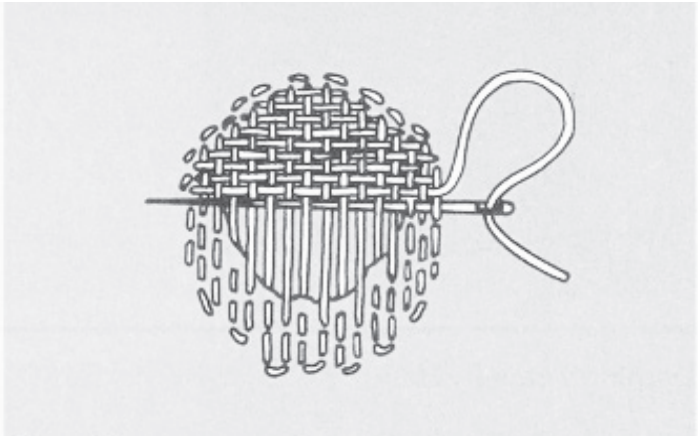
Darning Holes by Hand

If you're working without a support fabric, work on the wrong side of the garment. If you are using a support fabric, work on the right side. Use a single, unknotted thread.

Begin three or four fabric threads to the right of the damaged area, and take small vertical running stitches, passing the needle under and over equal groups of fabric threads. If the fabric threads are heavy or far apart, go under and over individual threads. As you stitch across the hole, alternately pass the thread over and under the edges of the hole. Your thread should lie fairly snug across the hole, but it should not be so tight that the fabric is puckered. Make the outer edge of your darn conform to the shape of the hole, making each row of stitching longer or shorter as needed *(fig. 2)*. Cover the hole completely with these vertical rows of stitches, and continue until the darned area extends three or four fabric threads to the left of the hole. Cut off the thread end when you have finished; you do not need to knot.

Beginning at the top of the darned area, work close rows of running stitches perpendicular to your first stitches. Weave the needle under and over each vertical thread, keeping the stitches so close together that they fill in the hole completely *(fig. 3)*. Cut the thread end. Steam-press the darn from the wrong side.

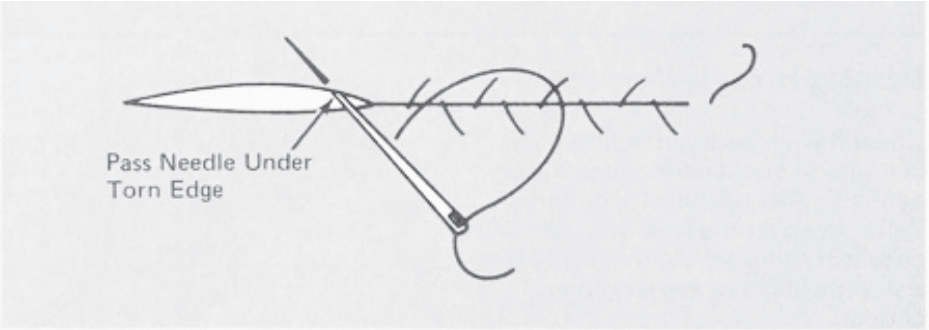


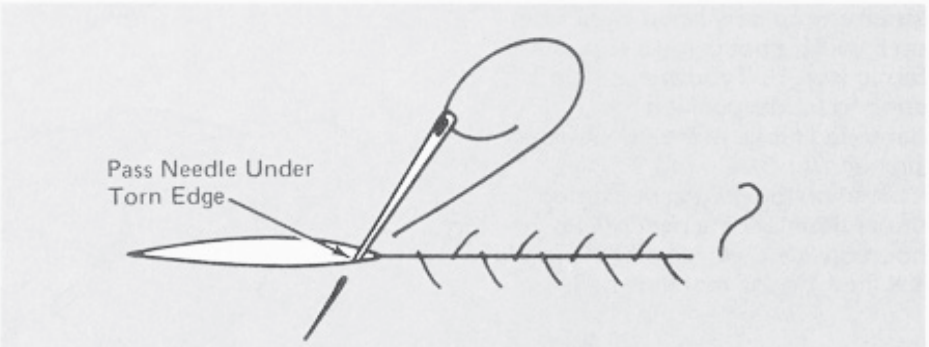


Darning Tears by Hand

First, use a single, unknotted thread to bring the edges of the tear together before you begin to darn. Insert the needle from the right side about ¼ inch (6 mm) beyond the tear, and bring it out about ¼ inch (6 mm) below the beginning of the tear. Pass the needle under the torn edge, bringing it up again through the opposite edge of the tear ⅛ to ¼ inch (3 to 6 mm) away. Continue across tear *(fig. 8)*. Do not knot. Leave a free thread end of about ¾ inch (20 mm).

When not using a support fabric, work on the wrong side of the garment. With a support fabric, work on the right side of the garment.





Using a single, unknotted thread, start working the darn ¼ inch (6 mm) beyond the end of the tear. Take tiny running stitches back and forth over the area *(fig. 9)*. Carefully weave the point of the needle through the fabric; on straight or L-shaped tears keep your stitches perpendicular to the line of the tear. (An L-shaped tear requires two rows of stitching, perpendicular to one another.) On a diagonal tear work short rows of stitches across the tear, keeping the stitches parallel to the fabric threads that run in that direction *(fig. 10)*. Keep the stitches loose enough so that they don't pucker the fabric, but tight enough to keep the fabric flat.

Do not take a stitch over the actual tear. When crossing the tear, slip the needle between the edges of the tear. End the darn ¼ inch (6 mm) beyond the tear, leaving a ¾ inch (20 mm) loose thread. Pull any loose thread ends from the right side to the wrong side.

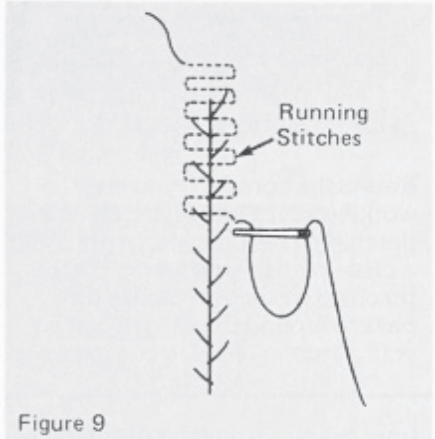


Figure 9

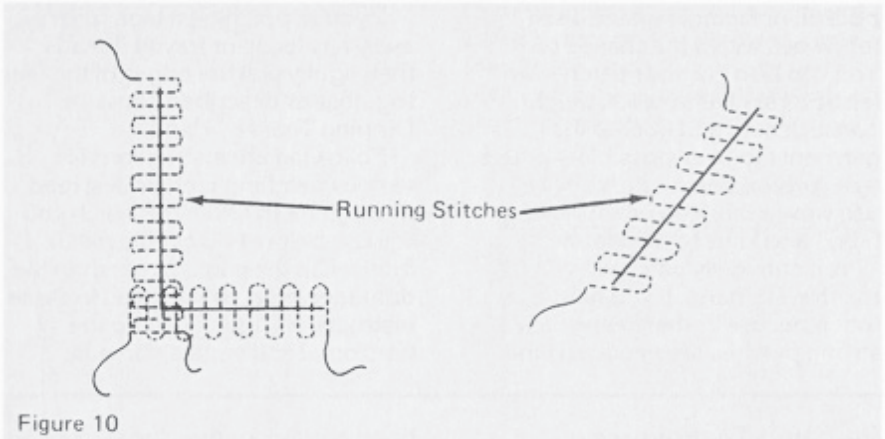


Figure 10

Preparation for Patching

Patching is the process of covering a hole, tear, or thin place with another layer of fabric. For best results, use a matching fabric. If you are repairing a home-sewn garment, cut your patch from leftover fabric. For a ready-made garment, use material from a hem, pocket, or facing; replace a self-fabric belt with a purchased one. You can also cut your patch from fabric as similar in color, weight, construction, and fiber to the garment fabric as possible—or use a decorative patch or trim. Always use woven fabric to patch woven fabric and knits for knit fabric.

You can apply patches by machine or hand. If you have a machine, use it where especially strong patches are needed. Hand stitching works best on small patches and in tight places.

If you're patching a hole, cut the hole exactly along the fabric threads into a square or rectangle. Keep the opening as small as possible. If the garment fabric tends to fray easily, use a single, knotted thread to overcast the edges of the hole by hand *(fig. 13)*.

If you're patching a tear, trim away any loose or frayed threads; then lightly pull the edges of the tear together as described above in Darning Tears by Hand.

Following are instructions for various patching techniques; read through them to decide which you will use before you cut the patch fabric. Cut the patch larger than the damaged area, as specified in these instructions, and cut along the horizontal and vertical threads.

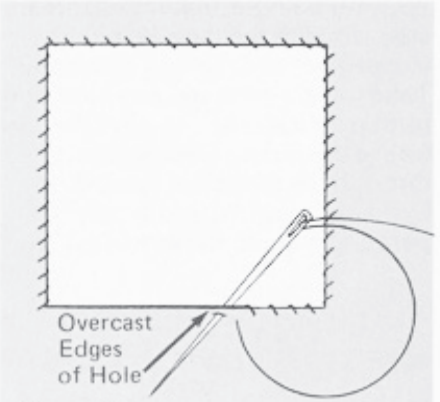


Figure 13

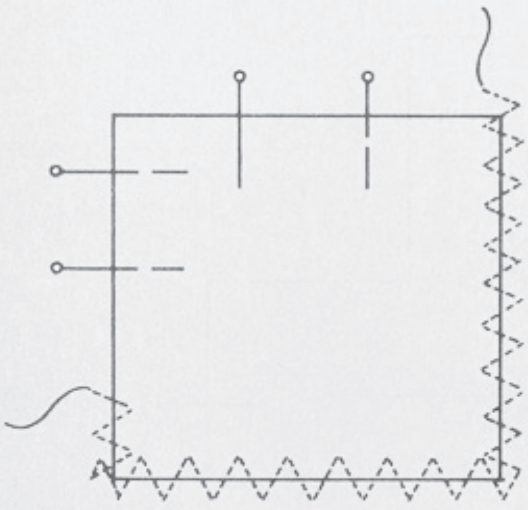
Round the corners if you are working with a knit fabric. If you are patching a plaid, stripe, or print with a piece of the same fabric, cut the patch so it exactly matches the pattern around the hole or tear so your patch will be less conspicuous.

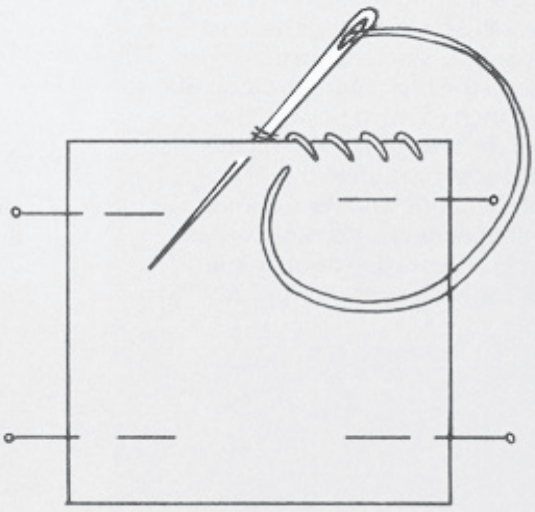
Patching Techniques

The overlap patch. This is a strong patch that can be used to repair large holes or tears on fabrics that don't fray easily.

Prepare the damaged area as described above. Cut the patch ½ inch (13 mm) larger on all sides than the hole or tear. Hold both garment and patch fabric right side up. Position the patch over the damaged area. Fasten it with pins, hand basting, or the glue stick. Stitch over all edges of the patch, attaching it to the garment. By machine, use a multi-step zigzag made with a short stitch and a wide width. If your sewing machine can't do this stitch, use a regular zigzag made with a short stitch and a medium width. Reinforce the corners by overlapping the stitching *(fig. 14)*.

If working by hand, use a double, knotted thread. Insert the needle from the wrong side of the patch so that it emerges ⅛ inch (3 mm) within the patch. Insert the needle into the garment fabric just above the edge of the patch about ⅛ to ¼ inch (3 to 6 mm) to the left. Bring the needle out through the patch ⅛ inch (3 mm) below its edge and ⅛ to ¼ inch (3 to 6 mm) to the left *(fig. 15)*. Repeat this process so that you have a row of even diagonal stitches all along the edges. Secure with a knot on the wrong side.


Figure 14


Figure 15

The hemmed patch. Use the hemmed patch on light- to medium-weight fabrics that tend to fray or where the patch needs to be particularly strong. Because two rows of stitching show on the right side of the garment, the hemmed patch is not easily hidden. Hand stitching helps to make the patch less conspicuous.

Prepare the damaged area. Cut the patch 1 inch (25 mm) larger on all sides than the hole. Fold under ¼ inch (6 mm) along each side of the patch, right sides together *(fig. 16)*. Press.

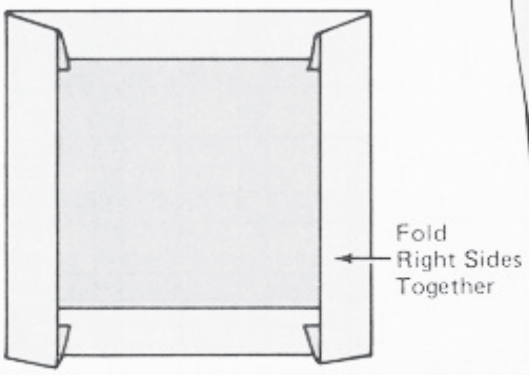


Figure 16

Position the right side of the patch against the wrong side of the damaged area. Make sure the patch is centered under the hole. Pin- or hand-baste in place—do not use the glue stick here *(fig. 17)*.

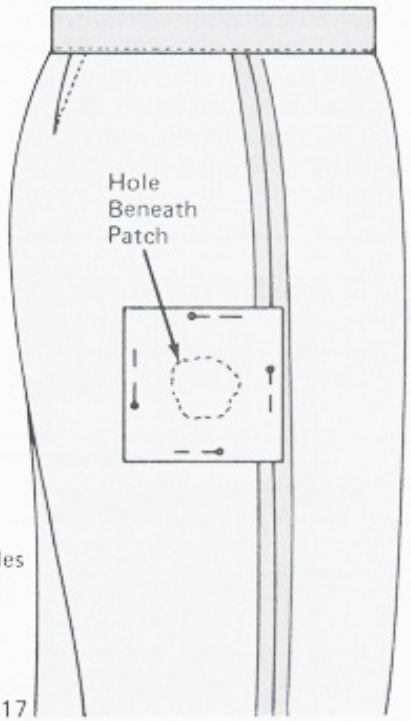


Figure 17

Working on the wrong side of the garment, stitch the patch around the outer edge *(fig. 18)*. By machine, use a small, straight stitch. By hand, use a single, knotted thread. Insert the needle through the garment fabric just under the edge of the patch. Then insert it into the fold along the edge of the patch, sliding it along the fold for ¼ inch (6 mm). Bring it out of the fold, and insert it through the garment fabric for about ¼ inch (6 mm). Repeat, pulling the thread through snugly with each stitch.

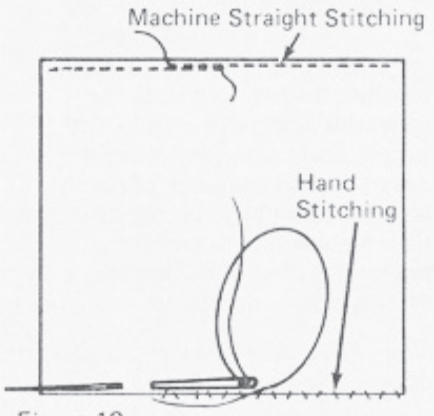


Figure 18

On the right side of the garment, cut ¼ inch (6 mm) into the corners of the hole. Carefully turn ¼ inch (6 mm) of the garment fabric to the wrong side. Tuck in the threads at the corners with the point of a pin. Press or hand-baste along the folds to keep them in place *(fig. 19)*. Hand or machine stitch around the edges. By hand, use a single, knotted thread and the same stitch you used on the wrong side. By machine, use a small, straight stitch *(fig. 20)*. Remove any basting stitches.

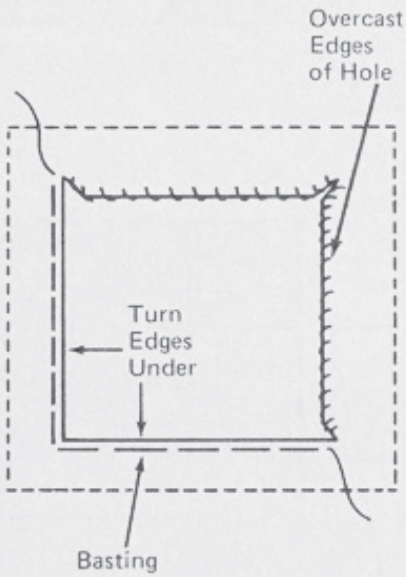


Figure 19

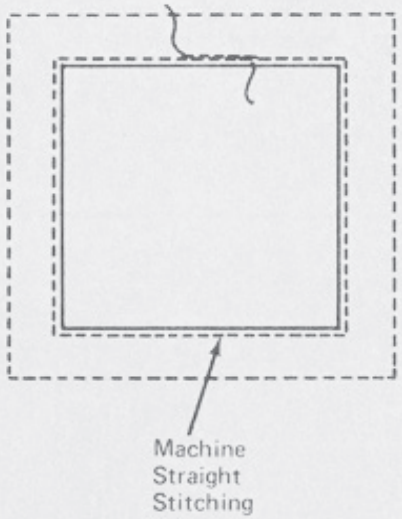


Figure 20

The oversewn patch. Use this patching technique to repair holes or tears on any light- to medium-weight fabric, especially plaid, striped, or printed fabrics. Since the stitching is done on the right side of the garment, it is easy to get a perfect match. The oversewn patch can be done by machine or hand.

Prepare the damaged area as described above. Cut the patch at least 1 inch (25 mm) larger all around than the hole or tear. If the fabric is to be matched, cut the patch so it will exactly match the area around the repair.

Turn under ⅜ inch (10 mm) along each edge of the patch, wrong sides together, and press *(fig. 21)*. Position the patch over the damaged area, wrong side of patch to right side of garment. Pin-, hand-, or glue-baste in place. Glue basting is best when you are trying to match a printed or striped fabric. It will not allow the patch to slip even the tiniest bit during the stitching process.

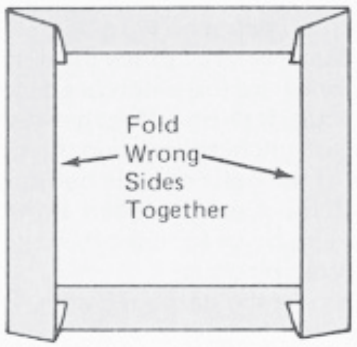


Figure 21

Stitch the patch in place. By machine, use a straight stitch *(fig. 22)*. By hand, use a single, knotted thread, fold back the garment along the edge of the patch, and catch the fold of the garment and the edge of patch together with tiny stitches *(fig. 23)*. Stitch each side in the same manner and knot the thread on the wrong side of the repair.

Tip: Most holes and tears can be covered with purchased appliqués, sew-on patches, ribbons, or trims. If you cannot match a patch or hide a darn, a decorative trim may solve the problem. Shop fabric stores and notions counters for possibilities. Fasten the patch or trim in place with fusible web, or stitch in place by machine or hand using the techniques in this chapter.

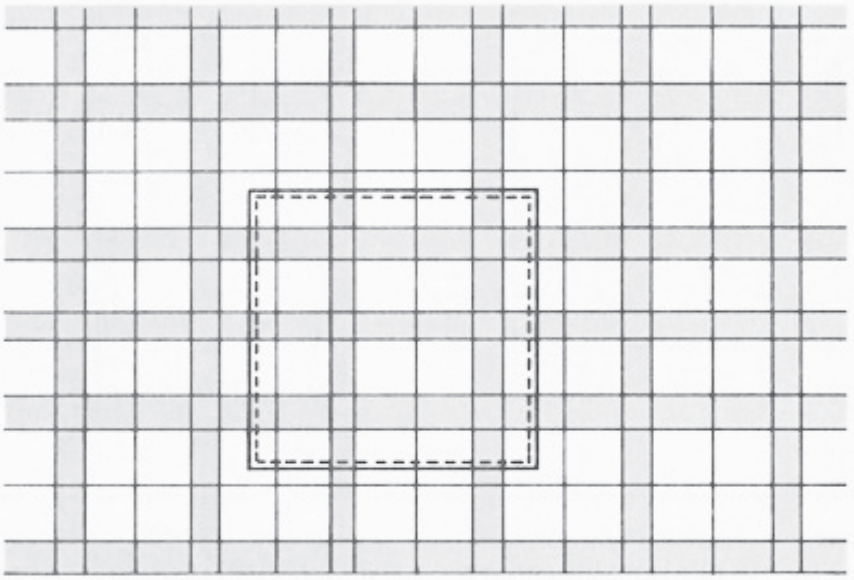
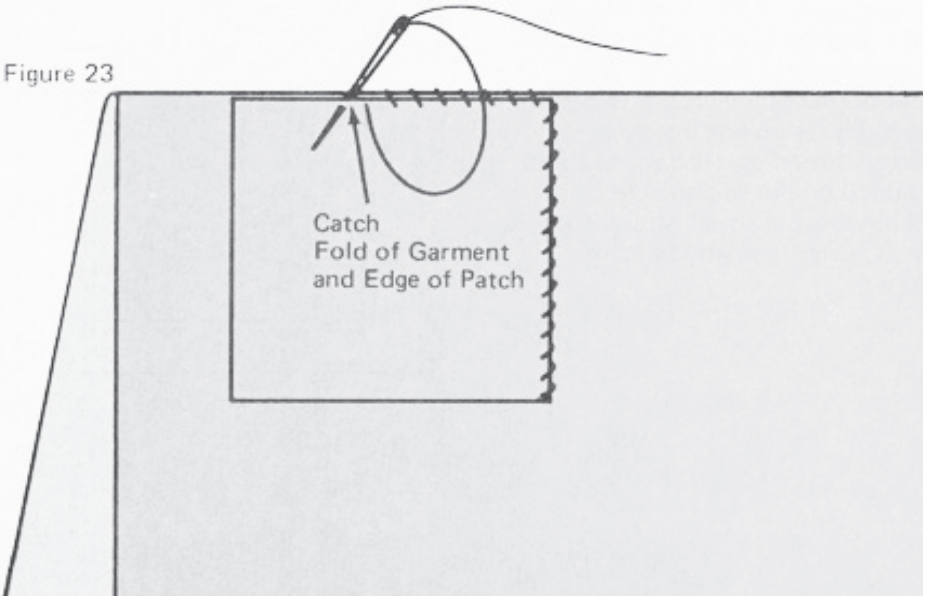


Figure 22

Figure 23



The set-in patch. This method is especially suitable for heavy fabrics. It can be done by machine or hand. Machine stitching is strong and quick, but hand stitching works better on small or tight areas.

Prepare the damaged area as described above, except carefully cut ¼ inch (6 mm) into the corners of the trimmed hole before overcasting the edges. Then turn under ¼-inch (6 mm) seam allowances to the wrong side. Be sure the seam allowances fold exactly along a thread of the fabric *(fig. 24)*. Press. Cut the patch ¾ inch (20 mm) larger on all sides than the trimmed hole.

Center the patch under the hole, right side of patch against wrong side of garment. Pin in place. Working on the wrong side, trim the edges of the patch so that they are even with the edges of the turned-under garment fabric *(fig. 25)*.

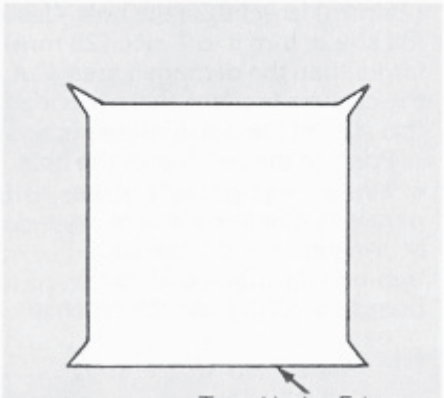


Figure 24

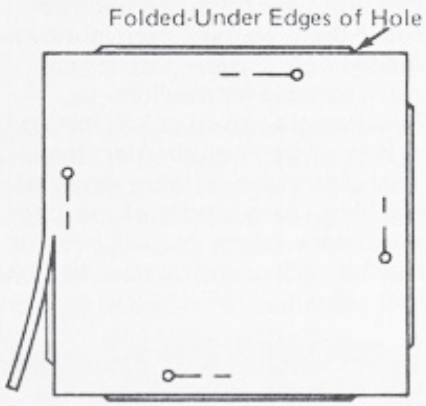


Figure 25

Unpin one side of the patch. Fold down the garment fabric as shown. Stitch exactly on the foldline through both patch and garment fabric, making sure the cut edges stay even *(fig. 26)*. By machine, use a straight stitch. By hand, use a single, knotted thread and a small, even backstitch. Work all four sides in the same manner.

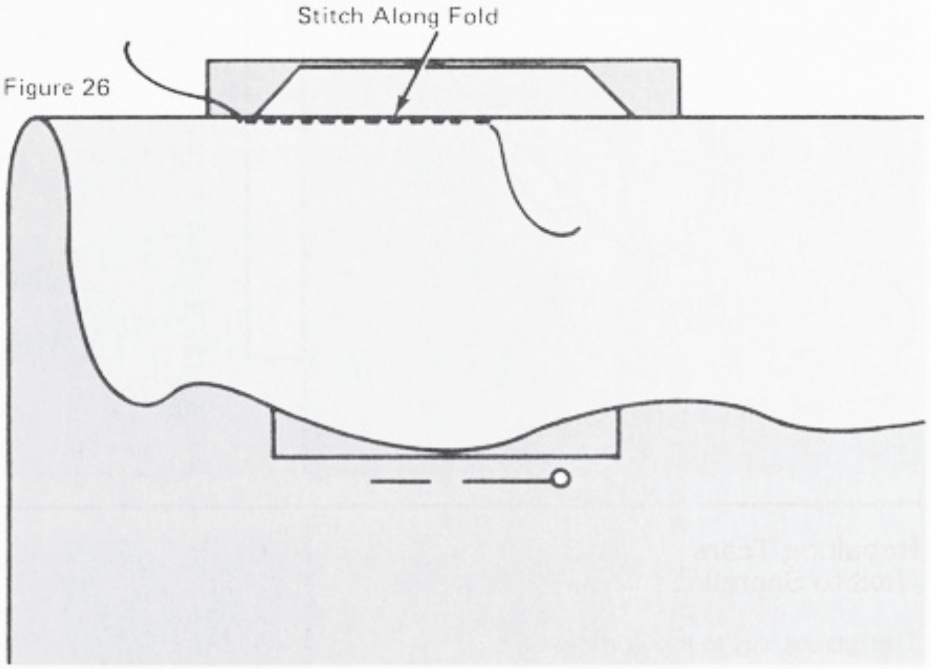


Figure 26

Trim the corners of the patch seam allowances to match those of the garment turnings. Press open the seam allowances. Use a single, knotted thread and an overcast stitch to finish the seam edges *(fig. 27)*.

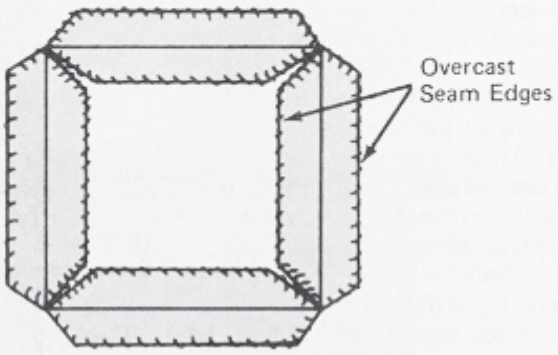


Figure 27

The iron-on patch. Fusible patches, applied with an iron, are a quick and easy way to repair holes and tears in many garments. You can purchase them premade or make them yourself from fabric and fusible web. Fusible patches are most suitable for medium- to heavyweight woven or knit fabrics.

Iron-on patches are machine washable; however, after repeated washing, many tend to come loose around the edges. A quick hand or machine stitch can be used to tack them down.

Choose a premade patch of the same or similar weight, style, and color as the garment fabric. Purchase a patch at least 1 inch (25 mm) larger than the hole. Use it full size or trim it to 1 inch (25 mm) larger than the damaged area. Cut the corners to make them rounded; this makes the patch more secure.

Position the patch over the hole or tear on the right side of the garment. Slip a piece of heavy brown paper under the hole, between the fabric and ironing board *(fig. 28)*. Fuse the patch in place with an iron, following the manufacturer's instructions.

Make your own fusible patches from a piece of fabric and a piece of fusible web cut the same size. Cut both at least 1 inch (25 mm) larger than the damaged area. With the garment right side up, position the web, then the patch fabric, over the hole or tear. Slip a piece of heavy brown paper under the hole, between the fabric and ironing board *(fig. 29)*. Fuse the patch in place with an iron, following the web manufacturer's instructions.

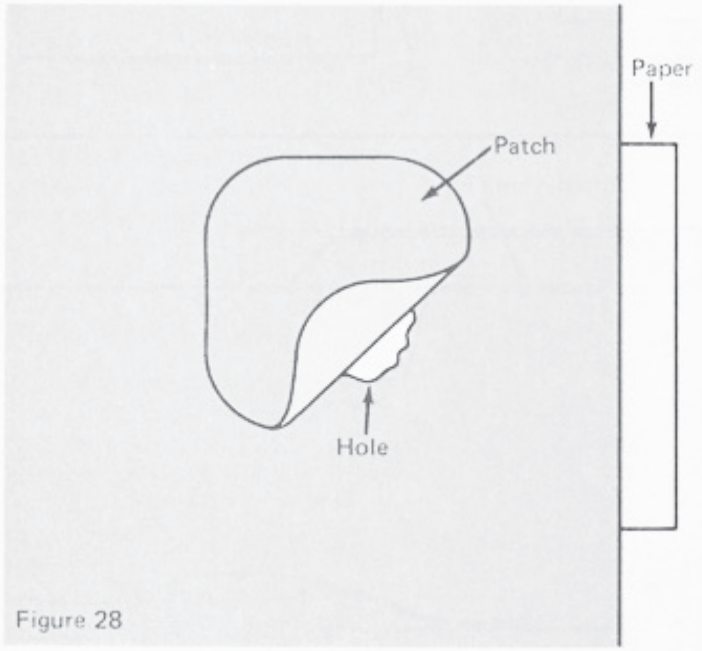


Figure 28

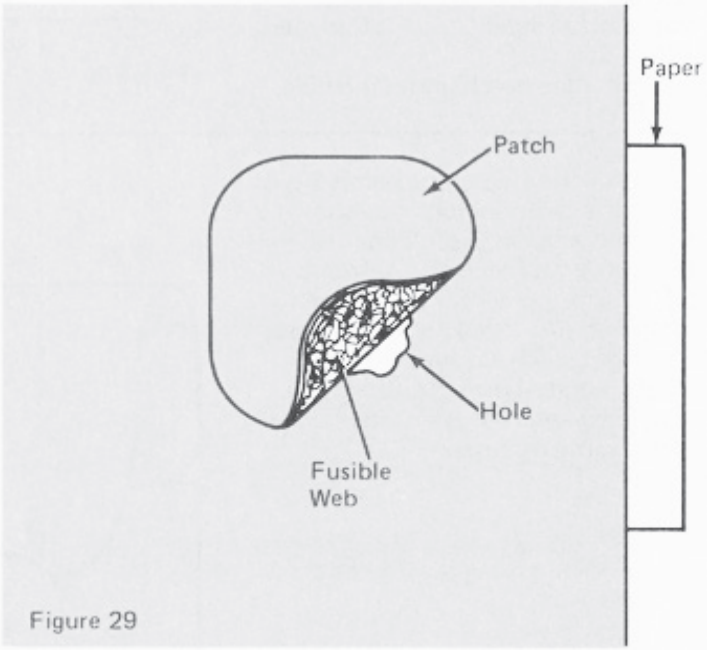


Figure 29

Repairing Zippers

All zippers are constructed in basically the same way. Interlocking metal or synthetic teeth are attached to fabric tapes. They are opened and closed with a slide, and the slide is prevented from running off the zipper by stops at the top and bottom *(fig. 1)*.

Some damaged zippers can be repaired—when a tooth comes off the tape or the slide is damaged or some stitching has broken. Other zippers must be replaced. Before attempting repair of a zipper, consider the age of the garment. If the zipper is wearing out, yet the garment is in good shape, it may be to your advantage to simply replace the zipper immediately.

Repairing Zippers

Broken stitching. If some of the topstitching around the zipper has broken, you can replace it with hand or machine stitching. Cut away any loose threads. Use a single, knotted thread and an even backstitch by hand. By machine, use a straight stitch and be sure to use the zipper foot. This is a specially designed presser foot that allows you to sew as close to the zipper teeth as you wish while still feeding the garment fabric smoothly. Extend your repair stitching ½ inch (13 mm) on either side of the broken stitches.

Broken tooth. If a tooth has come off the tape near the bottom of the zipper, you may be able to salvage the zipper by stitching a new stop above the damage. This will work only if the shortened zipper still allows you to take the garment on and off easily. To repair, first move the slide to the bottom stop. Snip into the zipper tape above the broken tooth. Slip the lowest functioning tooth into the slide. Close the zipper. Make a new stop by hand stitching a bar tack above the broken tooth. Use a double, knotted, heavy-duty thread. Insert the needle from the wrong side. Take five to eight stitches over the zipper teeth, pulling the thread through tightly *(fig. 2)*. Knot securely.

Figure 1

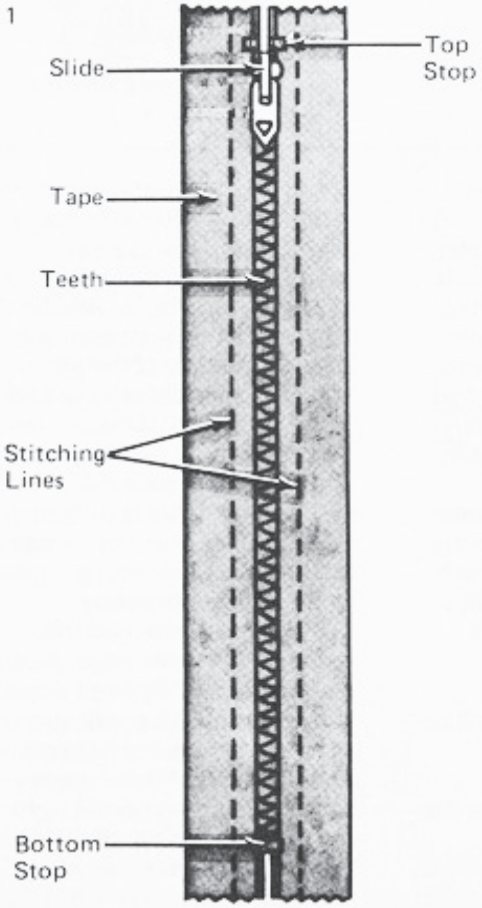
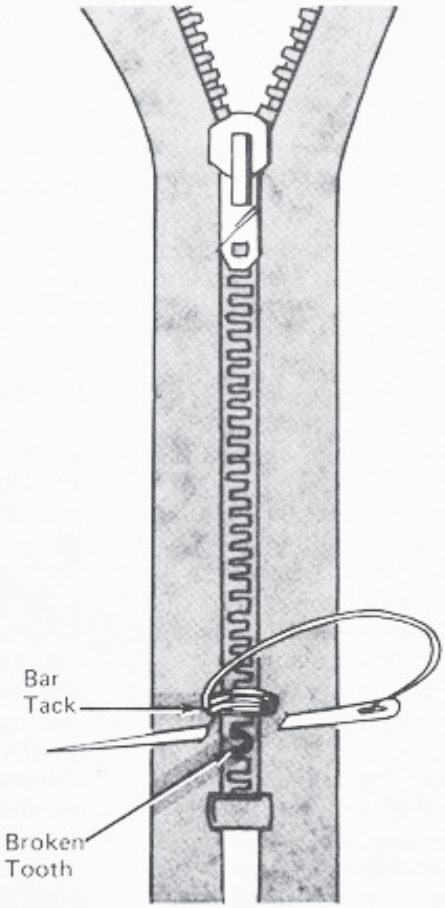


Figure 2



Damaged slide. If the slide has become damanged in some way or if it is so worn it will no longer properly close the teeth, allowing them to unmesh, you can try replacing the slide. Finding a new zipper slide that matches the damaged or worn one can be a challenge. Even the best notions counter rarely has them. Some wholesale tailors' suppliers might have them, but the best way to get replacement slides is to remove them from zippers on garments that are being discarded, and save them for future repairs.

Slides can be replaced only from the bottom end of the zipper. Use your seam ripper to remove any stitching to gain access to this area. Use the small blade of a strong pocket knife or similar tool to pry the stop off.

Slip the faulty slide off the end of the zipper. Slip the new slide in place *(fig. 3)*. Carefully feed each side of the zipper into the slide, tooth by tooth. Close the zipper. Replace the stop with a sturdy bar tack as described above *(fig. 4)*. Replace by hand or machine any stitching that has come loose or that had to be removed.

Figure 3

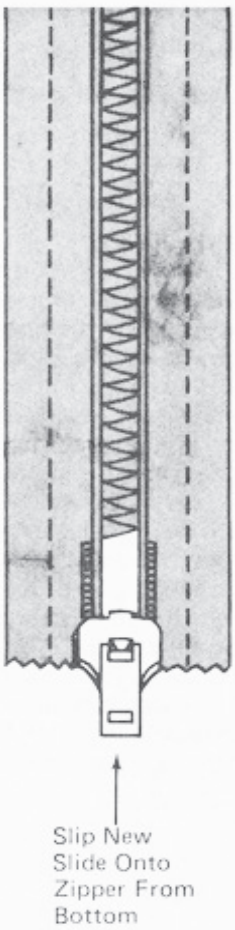
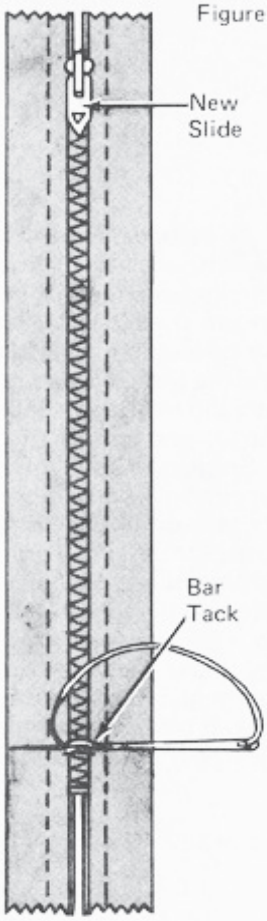


Figure 4



Replacing Zippers

When buying a replacement zipper, look for one that matches the original zipper as closely as possible in length, color, and type. (To measure a zipper, close it and measure from the bottom stop to the top of the slide. Then buy a zipper of that length or the next size larger.)

Note: You could use a zipper that is too long for an opening, but never one that is too short, otherwise a gap will show at the top of the closure. A too-long zipper should be positioned so that the extra length extends past the top of the garment. It will be cut off after the zipper is stitched in place, but before the waistband or facing is restitched. Just remember not to close the shortened zipper until after the facing or waistband has been stitched down, because until then there will be no stop to keep the slide on.

Zippers are available with metal teeth or synthetic (usually polyester) coils. A metal zipper is very strong and is often used for men's pants and other heavy-duty applications. Synthetic coil zippers are finer and more lightweight, but are still very sturdy. They are suitable for many applications.

Soak the new zipper in hot water for ten minutes. Allow it to drip-dry. Or run it through the regular wash and dry cycles of your automatic washer and dryer. This process will preshrink the zipper and is especially important if you are putting it into a garment that will be machine washed and dried. Otherwise puckers might form around the zipper opening after the garment is washed.

Carefully remove the faulty zipper from the garment, using your seam ripper to unpick and remove the stitching. As you work, take note of how the zipper was sewn into the garment so you can make your repair look as much like the original as possible. Rip out approximately 2 inches (5 cm) of the stitching holding the waistband or facing in place at the top of the zipper opening. This enables you to completely remove the old zipper, even the part that is tucked out of sight. Do not press the repair area; the folds will help you get everything back together properly.

Zippers are stitched into garments in three ways: a center slot, lapped, or fly-front application. In the center slot application, the zipper is concealed beneath two fabric flaps and there are two visible rows of stitching on the right side of the garment an equal distance from the seamline on either side. Center slot applications are commonly used for center back openings in skirts and dresses. Only one fabric flap covers the zipper and there is only one row of stitching to the left of the seamline on a lapped application. This type of application is common on left-side openings of skirts and pants. In the fly-front application, used at the center front of pants, the zipper is concealed by a wide flap of fabric and a fabric shield covers the back of the zipper.

You can replace a zipper by hand or machine. Directions for each type of application follow.

Center Slot Zipper

Slip-baste the zipper opening closed using a single, knotted thread: Slide the needle along the fabric fold of one side of the opening for about ¼ inch (6 mm) and then along the fabric fold of the other side for the same distance *(fig. 5)*. Lightly pull the thread, closing the opening smoothly.

Working on the wrong side of the garment, center the zipper face-down on the slip-basted seam allowance. The bottom of the teeth or coil should be at the bottom of the basted opening. The top of the slide should be at or slightly below the horizontal seamline at the top of the basted opening. Baste down one edge of the zipper tape and up the other edge *(fig. 6)*. Baste by hand, using a single, knotted thread. Work through both layers of fabric and the zipper tape so the basting shows on the right side.

Figure 5

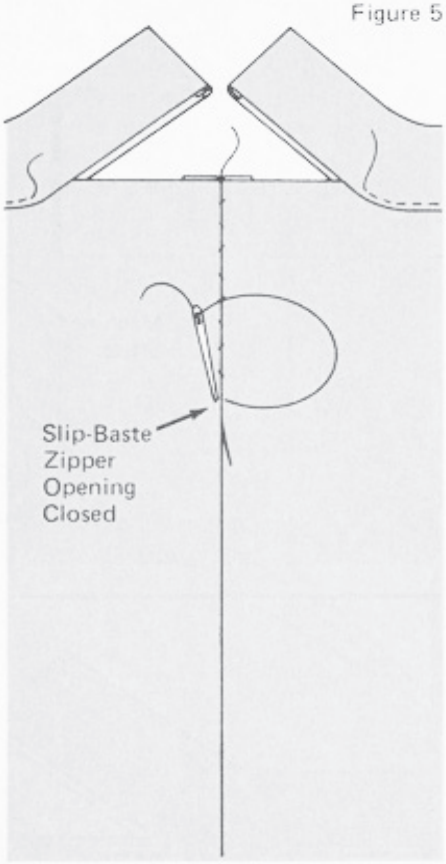
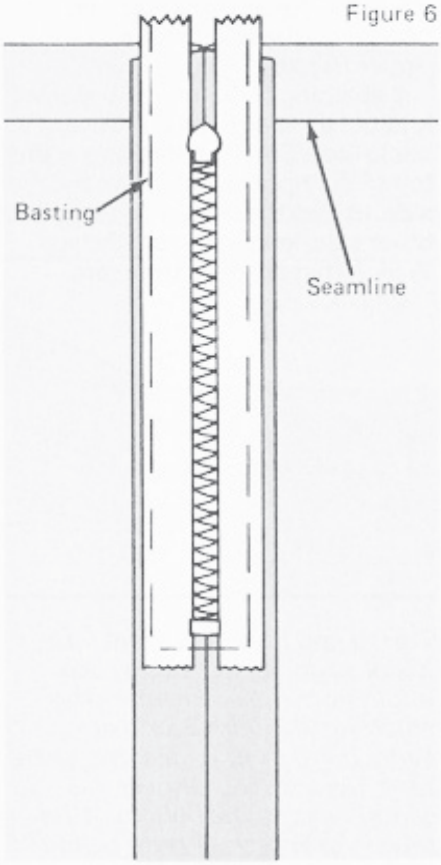
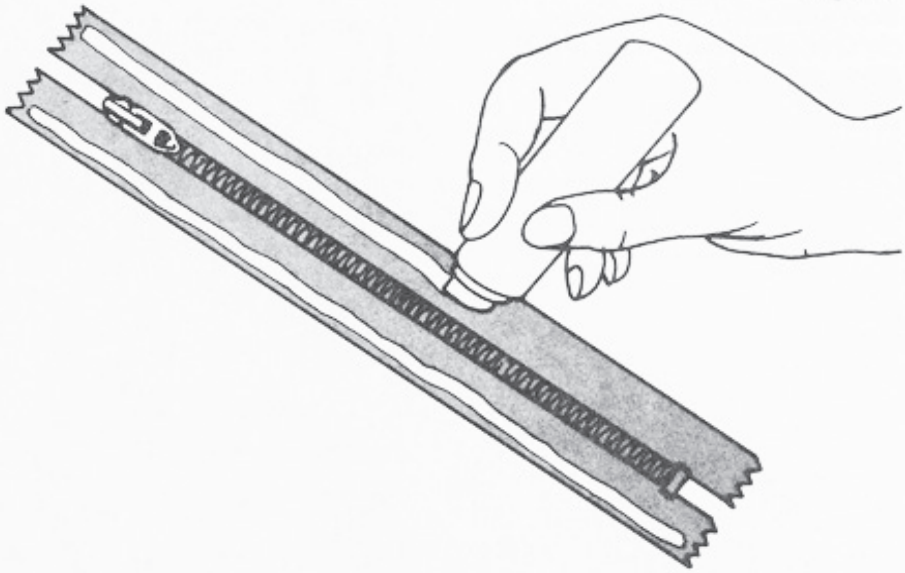


Figure 6



Tip: Use your glue stick to baste. Apply a thin strip of glue along the outside edge of each zipper tape, then position the zipper against the seam allowance (fig. 7).

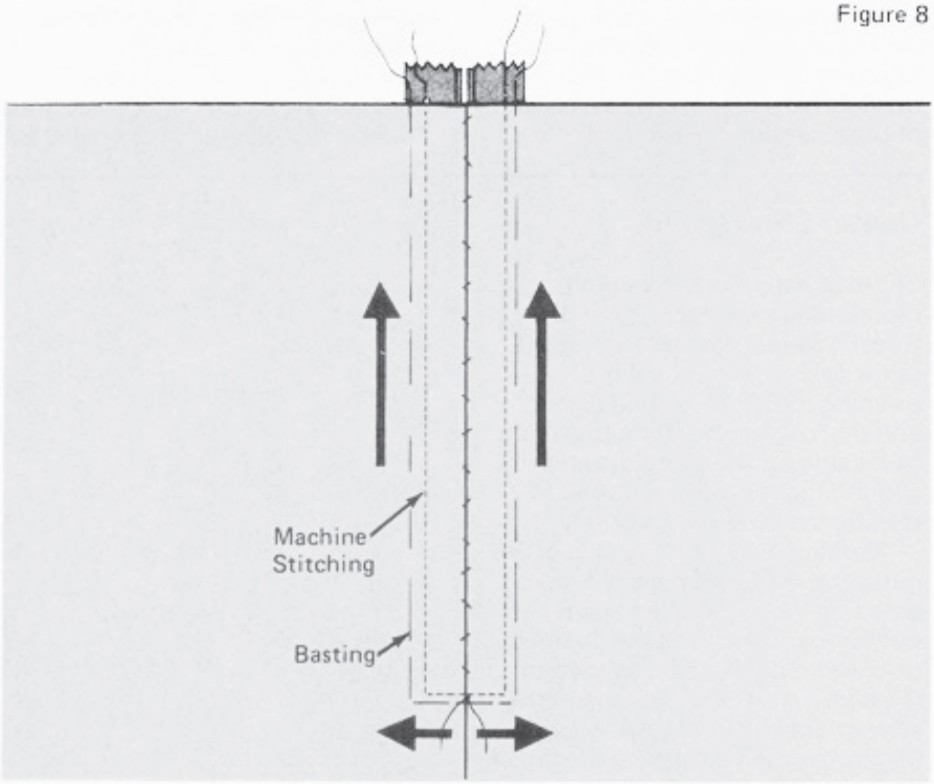
Figure 7



Now permanently stitch the zipper by machine or hand. If using the machine, start stitching ¼ inch (6 mm) below the bottom of the garment opening, stitching across the bottom of the zipper and then up one side ¼ inch (6 mm) from the seam. Repeat this stitching pattern on the other side of the zipper *(fig. 8)*.

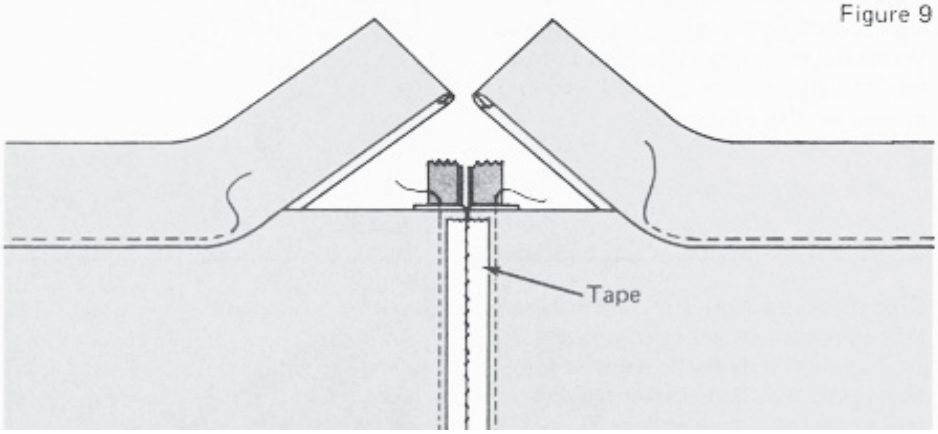
If stitching by hand, use a single knotted thread and a small even backstitch. Start the stitching at the top of the zipper, work down the side, across the bottom, and up the other side, keeping your stitches ¼ inch (6 mm) from the seam.

Figure 8



Tip: If you have a difficult time keeping your stitches an even width from the seam, mark the stitching line with a strip of ½-inch (13 mm) wide transparent tape. Center the tape over the seamline with the bottom of the tape strip ¼ inch (6 mm) below the beginning of the garment opening (fig. 9). Use the edges of the tape as a guide for straight, even stitching, but be sure you don't stitch into the edge of the tape.

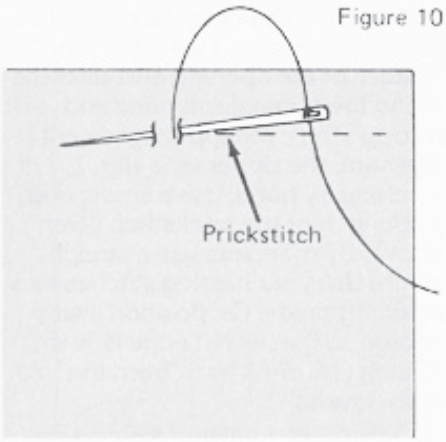
Figure 9



For a good dress or skirt, you could use a hand prickstitch for a finer finish. The prickstitch is very similar to the backstitch, except that the stitches on the right side are very tiny, nearly invisible. Use a single, knotted thread. Insert the needle from the wrong side. Take a small stitch (two or three fabric threads wide) by inserting the needle behind the point where the thread emerges. Bring the needle up through the fabric ¼ inch (6 mm) in front of where the thread emerges *(fig. 10)*. Repeat this process around the zipper opening, making small, neat stitches.

Remove all basting stitches, and open the zipper. Position the waistband or facing pieces as they were originally, and restitch them by hand or machine. If you are stitching by machine, be careful as you stitch across the zipper teeth so that you don't break the needle. Better yet, run the machine by hand for those few stitches so you can stop it immediately and reposition the fabric if the needle touches the teeth.

Figure 10



Lapped Zipper

In a lapped application, one side of the zipper is first sewn to the side of the garment which will lie under the fold of fabric that conceals the zipper; i.e., you sew one side of the zipper to the underlap. The other side of the zipper will then be sewn to the overlapping garment layer.

Do not baste the zipper opening closed. Position the closed zipper faceup under the underlap side of the garment opening so the teeth or coil are next to the fabric fold, and the bottom of the teeth or coil are at the bottom of the opening. Pin- or glue-baste in place, and stitch along the fabric fold *(fig. 11)*. By hand, use a single, knotted thread and a small, even backstitch. By machine, use a straight stitch.

Lay the overlap over the zipper, as it was originally, and hand- or glue-baste the other side of the zipper tape to the overlap *(fig. 12)*.

Figure 11

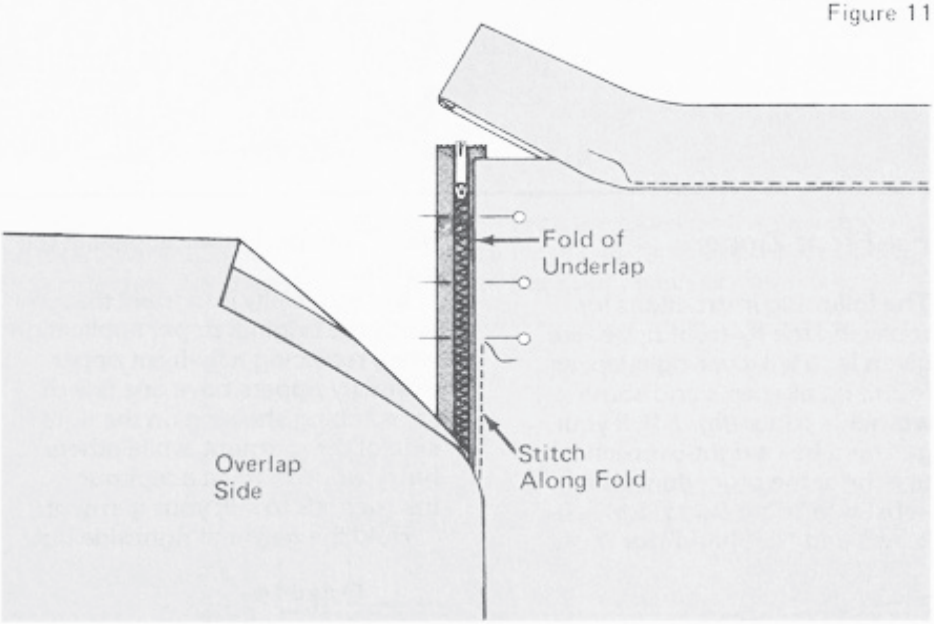
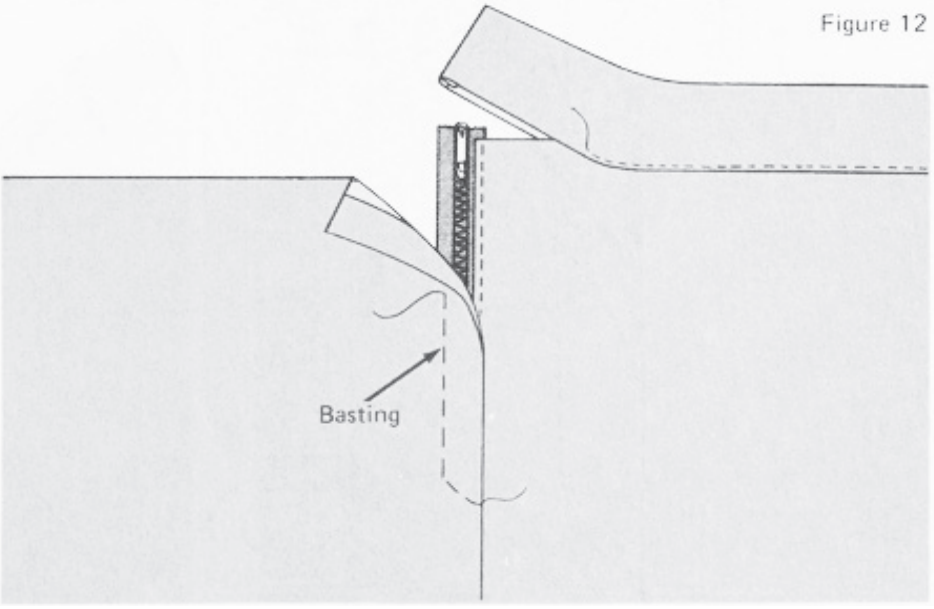


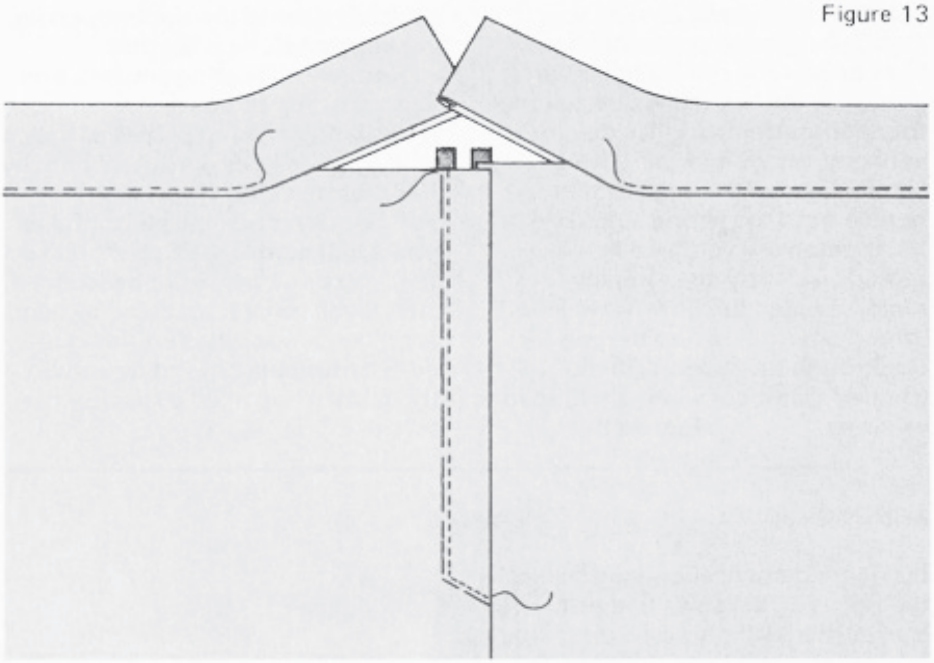
Figure 12



Stitch the zipper to the overlap by hand or machine, starting at the bottom of the opening and stitching along the original seamline and through the overlapping garment layer and the zipper tape *(fig. 13)*. If stitching by hand, use a small, even backstitch or the prickstitch given above. By machine, use a straight stitch. Use your basting stitches as a stitching guide. Or, position a strip of tape so that its left edge is ⅜ to ½ inch (10 to 13 mm) from the fold of the overlap.

Remove any basting stitches. Reposition the waistband or facing pieces, and restitch them by hand or machine.

Figure 13



Fly-Front Zipper

The following instructions for replacing the fly-front zipper are given for a left-over-right lap, as found on all men's and some women's pants *(fig. 14)*. If your garment has a right-over-left lap, use the same procedures but substitute "right-hand" for "left-hand" and "left-hand" for "right-hand" whenever they appear in the instructions.

It is especially important that you study the original zipper application when replacing a fly-front zipper. Some fly zippers have one line of topstitching showing on the right side of the garment, while others have two. You must adapt our instructions to suit your garment.

Hold the garment right side out, and open the zipper. With your seam ripper, remove the line or lines of topstitching and any bar tacks on the overlapping (left-hand) side. Mark where the topstitching line or lines were with hand basting, using a single, unknotted thread of a contrasting color *(fig. 15)*. Work the basting through just the top layer of the garment, not through the facing too. Then turn to the

Figure 14

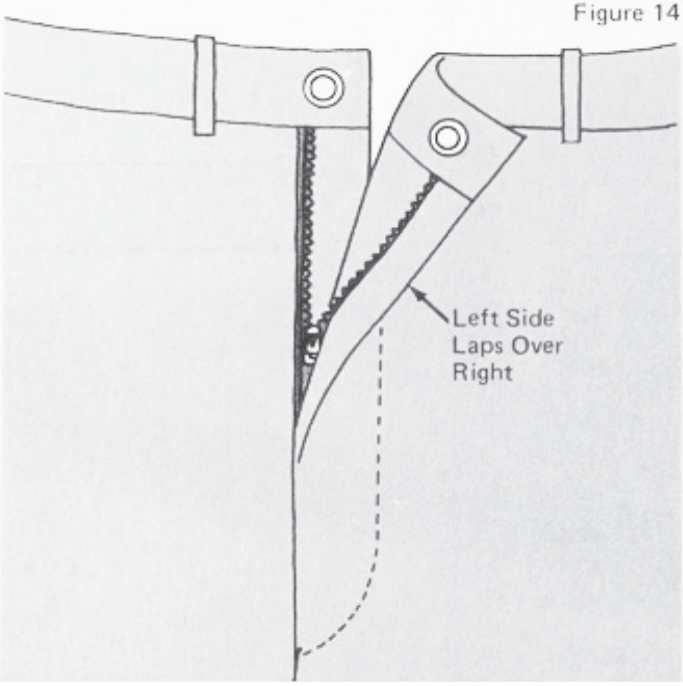
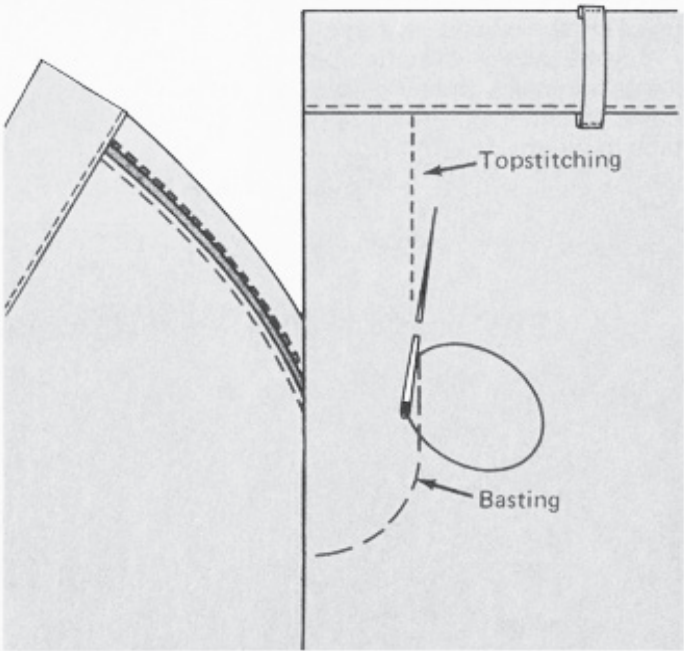


Figure 15

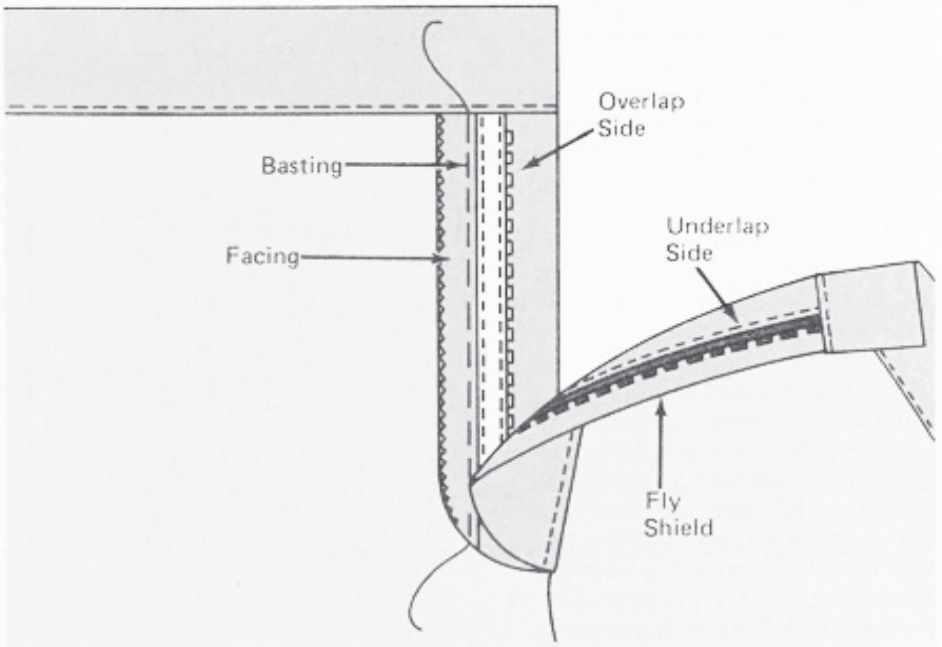


inside of the same part of the garment, and hand-baste along the edge of the zipper tape, through the facing fabric only, using a single unknotted thread *(fig. 16)*.

Carefully unpick all the stitching holding the zipper in place. Remove the stitching holding the waistband for about 2 inches (5 cm) on either side of the zipper. On the inside of the overlap (left-hand) side of the garment, mark the point where the bottom of the zipper teeth or coil ended with a pin, chalk dot, or small basting stitch.

Most fly-front zippers have a fly shield on the underlap side. This is a piece of fabric extending beyond the zipper teeth or coil towards the center front. Some fly shields are made from a separate piece of fabric that is stitched under the zipper, while others are cut as one with the pants front. The procedure for applying the zipper to the right-hand side of the garment will be determined by the type of fly shield.

Figure 16

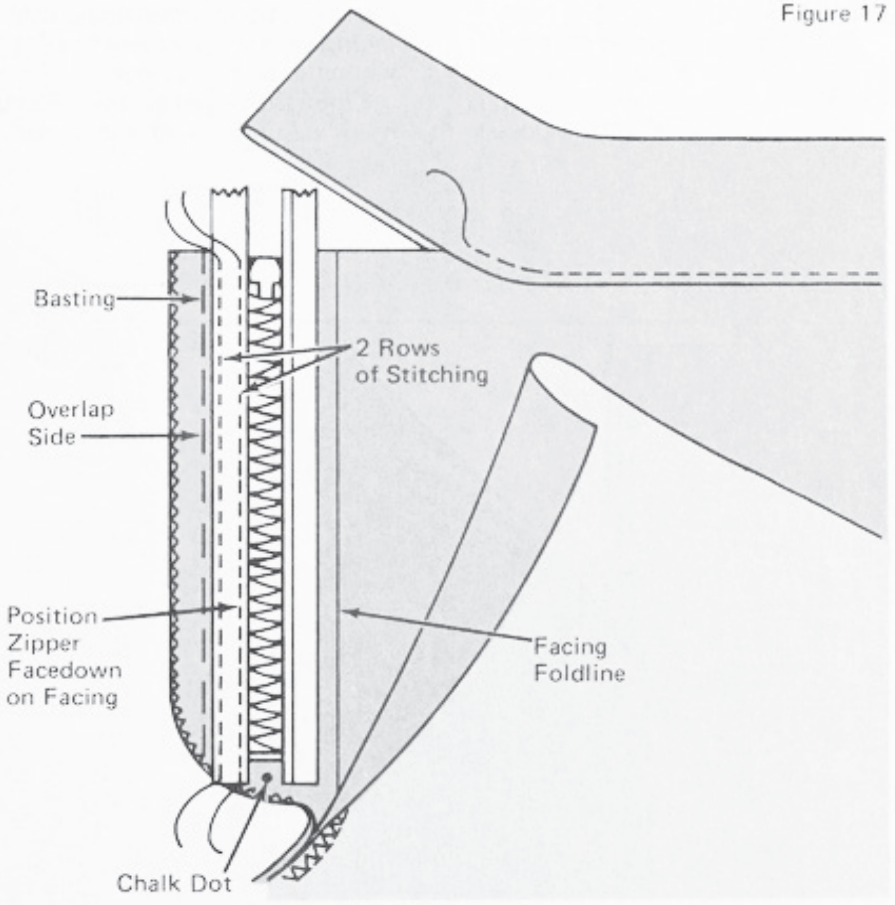


You will remove the stitches holding the fly shield when you unpick the zipper stitches. Set it aside.

Trim the tapes on the new zipper to ¼ inch (6 mm) below the bottom of the zipper teeth or coil.

The overlapping (left-hand) side. Fold the facing away from the garment front so that you are looking at the right side of the fabric of both the outer garment layer and the facing. Position the zipper face-down on the facing with the edge of the tape along the basted line, and the bottom of the teeth or coil at the pin or thread mark. Pin in place and machine or hand stitch the zipper tape to the facing only, making two rows of stitching as shown *(fig. 17)*.

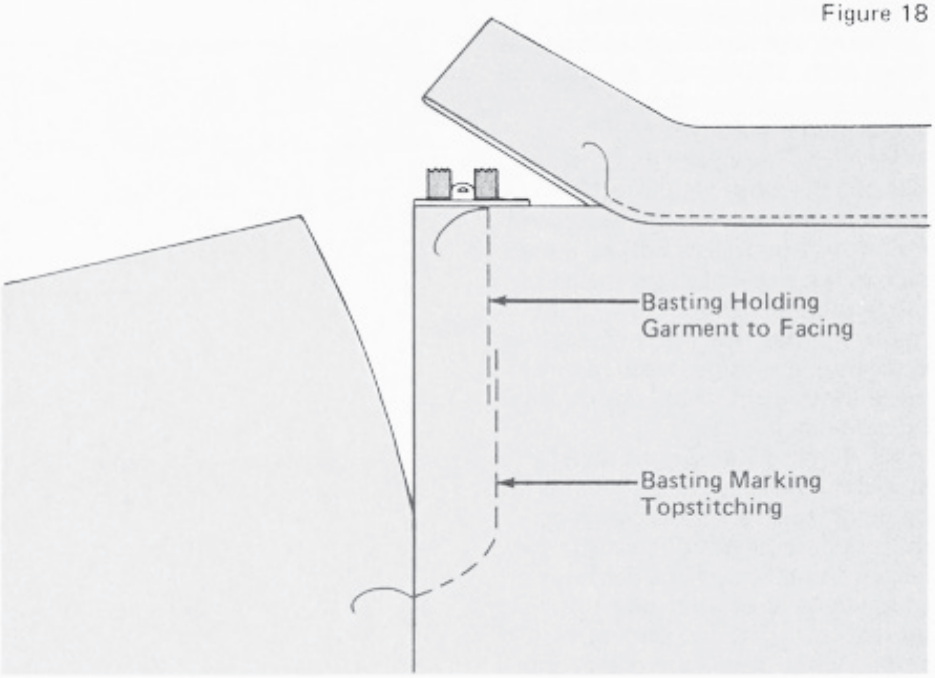
Figure 17



Fold the facing back in position against the garment, and pin in place. Working on the right side of the garment, hand-baste the garment and facing together next to the basting line or lines already there. Remove the basting stitches you used to mark the topstitching *(fig. 18)*.

Open the zipper. If your zipper is too long, trim away any excess from the top of the zipper on the stitched side only. Arrange the waistband in its original position. Restitch the waistband by hand (using a backstitch) or machine (using a straight stitch). Remember not to close the trimmed zipper until the waistband has been stitched in place, and if you are stitching by machine, be careful as you stitch across the zipper teeth so you don't hit them with the machine needle.

Figure 18



The underlapping (right-hand) side. Your procedure on this part of the garment will be determined by whether you have a separate fly shield or a cut-as-one fly shield.

If you have a separate fly shield, hold the garment right side out. Pin the folded edge of the underlapping side over the zipper tape as close to the teeth or coil as possible *(fig. 19)*. Close the zipper, and check that the garment fronts lie flat. If not, reposition the zipper, moving it up or down along the facing until the garment lies flat when the zipper is closed.

Open the zipper and position the fly shield underneath the zipper. Adjust the placement so the original seamlines are directly on top of each other and the edge of the shield meets the end of the waistband when it is back in place. Hand-baste the shield in place ¼ inch (6 mm) from the fabric fold of the garment *(fig. 20)*. Remove the pins.

Figure 19

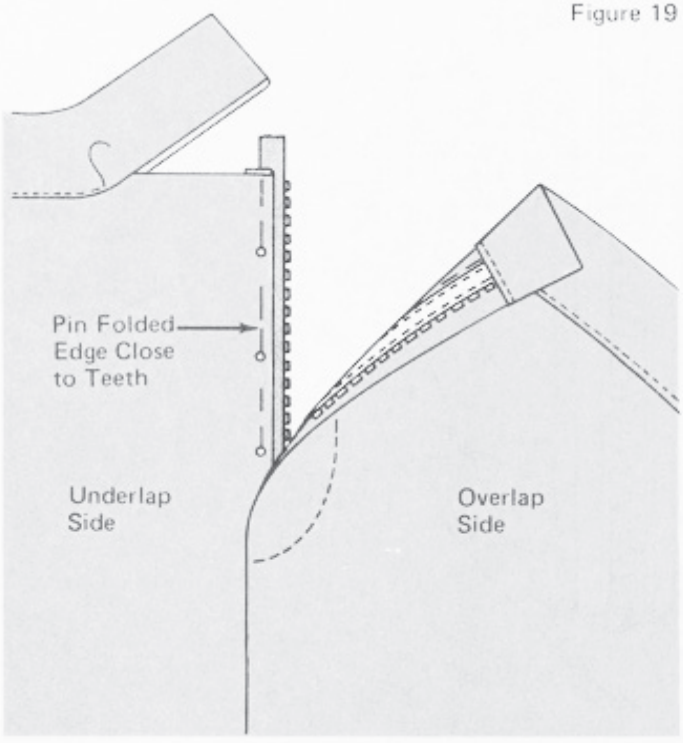
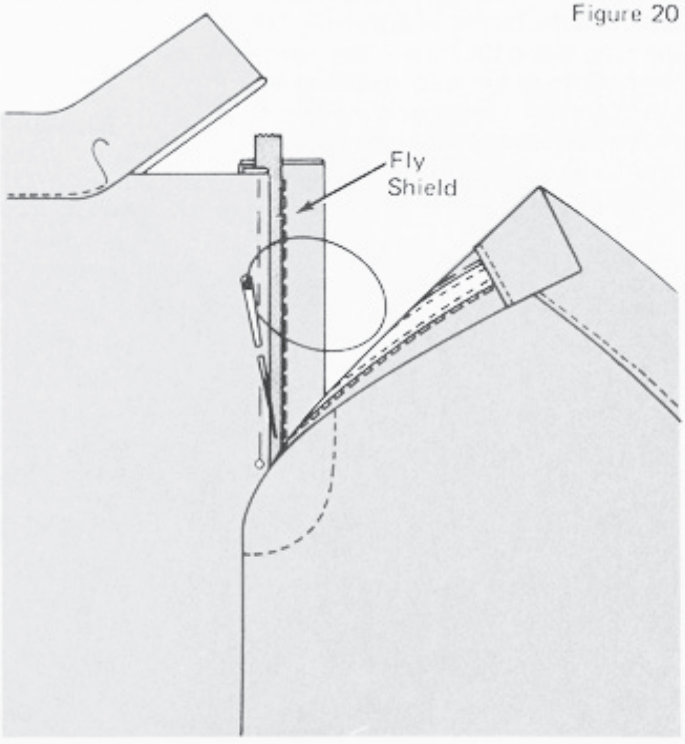


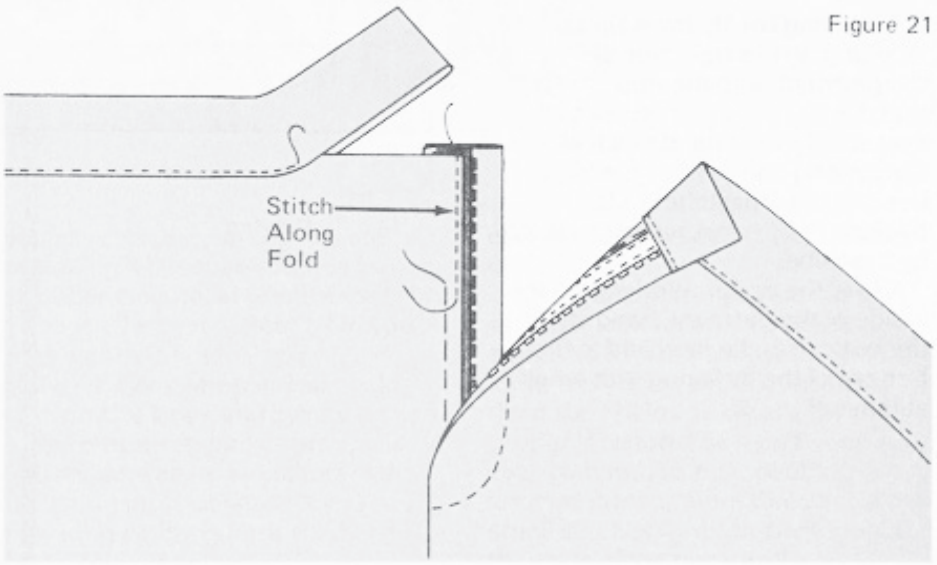
Figure 20



Trim away any excess zipper tape at the top of the zipper opening and hand or machine stitch through all fabric layers and the zipper tape, along the fold of the garment front *(fig. 21)*. Remove the basting.

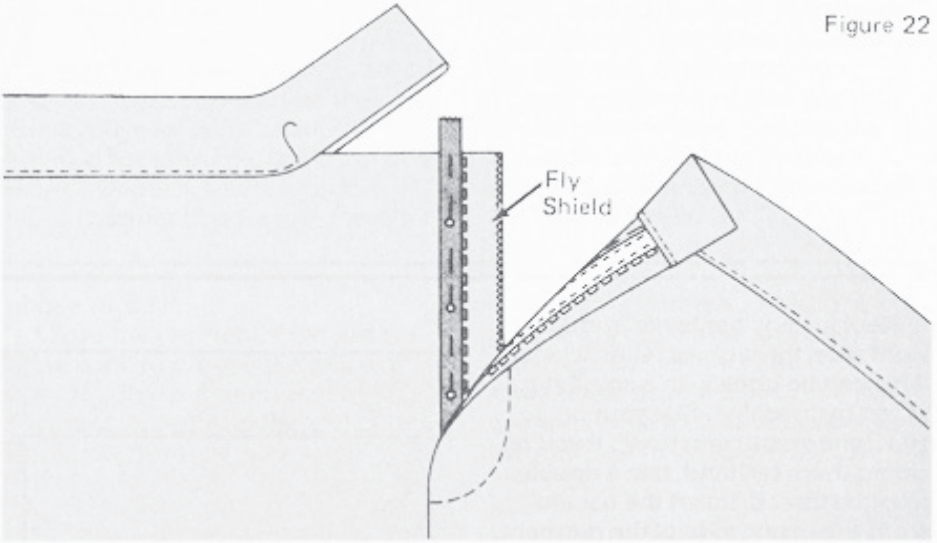
Position and restitch the waistband by hand or machine, being careful, if stitching by machine, that you don't break the needle on the zipper teeth.

Figure 21



If your fly shield was cut-as-one with the garment, follow this procedure. With the garment right side out, pin the zipper tape to the fly shield, over the original stitching line *(fig. 22)*. Close the zipper and see if the garment fronts lie flat. If not, reposition the zipper as necessary, and pin again.

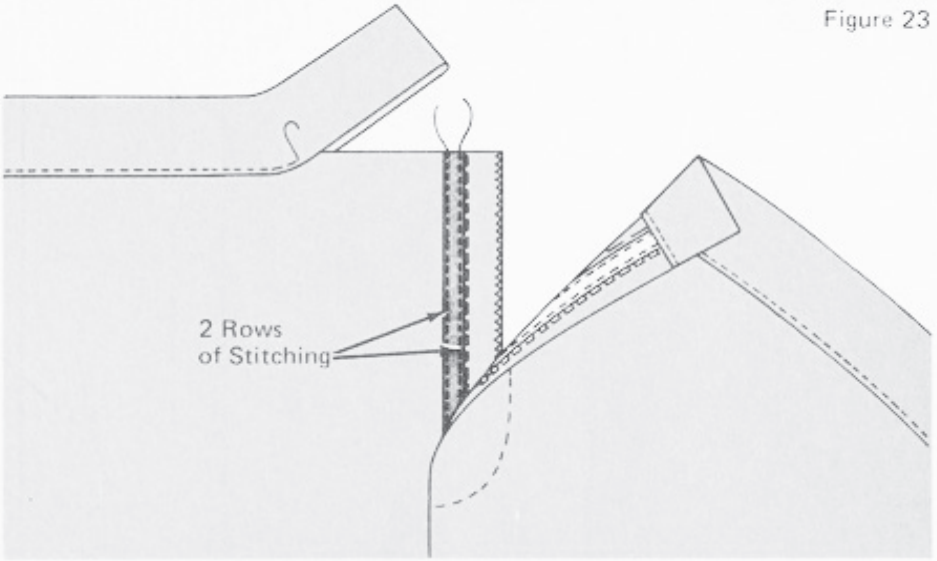
Figure 22



Open the zipper, and stitch it in place by hand (with a backstitch) or machine (straight stitch) with two lines of stitching. Trim away any excess zipper at the top of the opening *(fig. 23)*.

Position and restitch the waistband by hand or machine, being careful, if stitching by machine, that you don't break the needle on the zipper teeth.

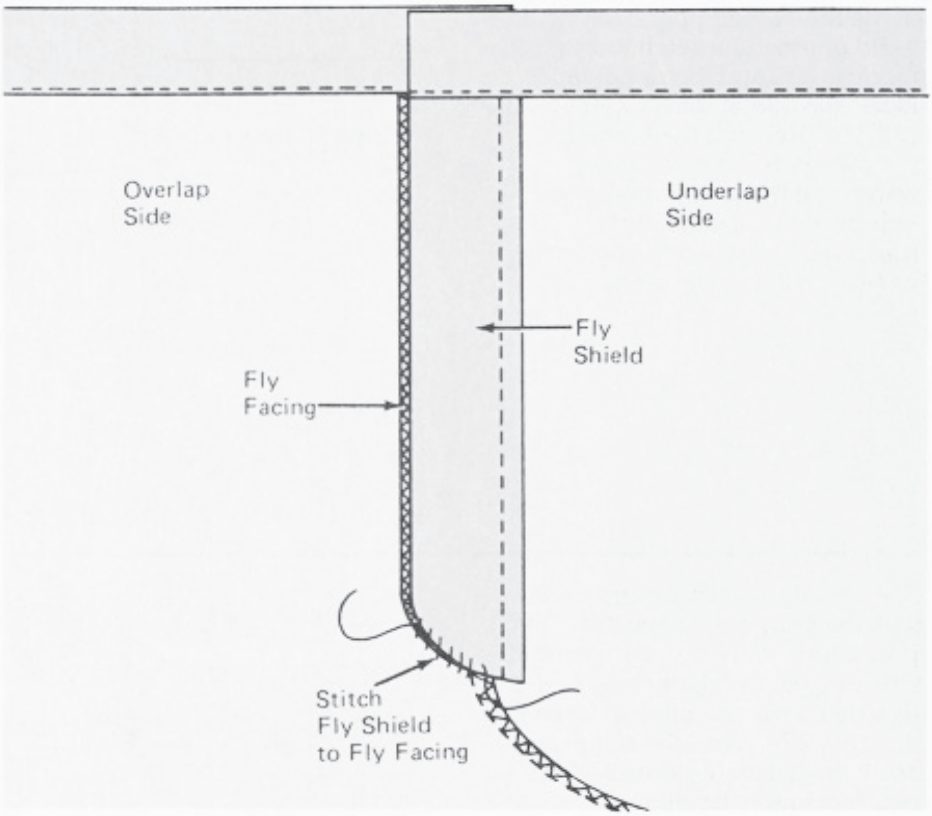
Figure 23



Finishing the fly-front zipper. Working on the right side of the garment, with the zipper open and the fly shield tucked out of the way, machine or hand stitch along the basting line or lines marking the original topstitching. Use a backstitch by hand, a straight stitch by machine.

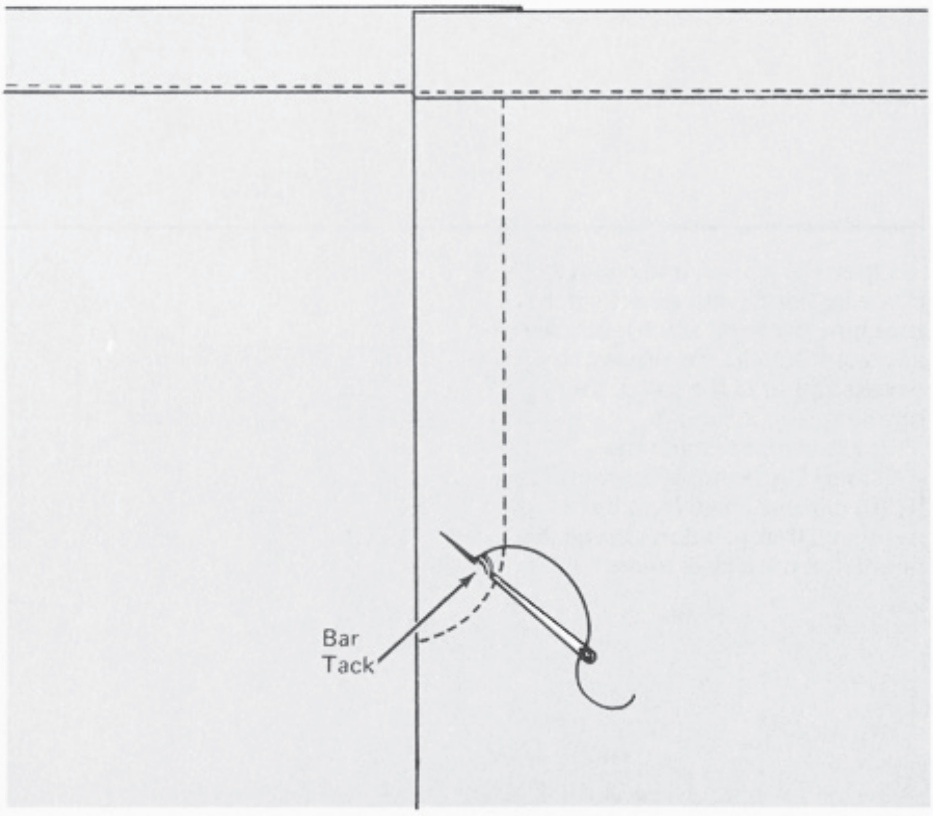
Close the zipper. Working on the inside of the garment, hand stitch the bottom of the fly shield to the bottom of the fly facing with small stitches *(fig. 24)*.

Figure 24



Replace any bar tacks from the right side, through all fabric layers. This can be done with a small zigzag stitch by machine. See your machine instruction book. If you're doing them by hand, use a double, knotted thread, insert the needle from the wrong side of the garment, and work the bar tack as shown, making it as long as the original bar tack *(fig. 25)*.

Figure 25



Repairing Pockets

Pockets can be classified into four types: patch, in-seam, front-hip, and set-in *(fig. 1)*. Patch pockets are made by attaching a separate piece of fabric to the exterior of the garment. The other types are constructed with an interior pocket bag that is attached to an opening in the garment.

The most common pocket repair is probably the replacement of some missing stitches, although sometimes pockets need to be patched or darned. Most such repairs can be done by either machine or hand. However, when working in tight areas, hand sewing may be easier.

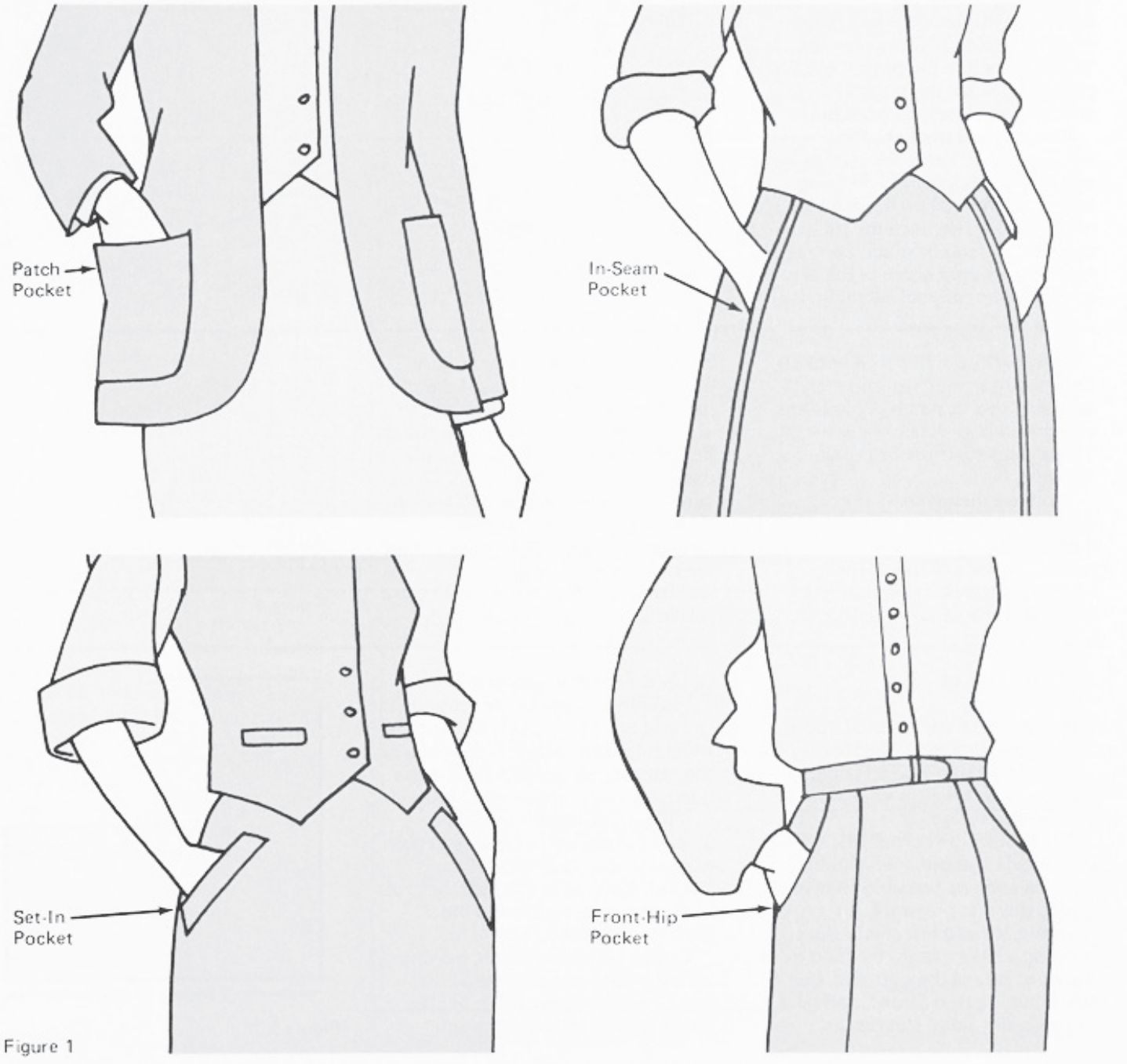


Figure 1

Patch Pockets

Mending patch pockets generally involves the replacement of a few missing or broken stitches. If the garment you're working on is lined, you'll have to rip out some of the stitches holding the lining in place to gain access to the wrong side of the pocket. When your repair is complete, replace the stitches you ripped out.

If the pocket fabric is torn, take the pocket off the garment to mend it. Use the appropriate technique from the Holes & Tears chapter. When you stitch the pocket back in place, duplicate the original stitching as closely as possible.

Topstitched pocket. Pin-, hand-, or glue-baste the pocket in position, if necessary. Trim away any loose threads on the right side of the pocket. Replace the missing stitches by hand or machine. Use a machine straight stitch of the same length as the original stitching. By hand, use a single, knotted thread and an even backstitch. Start and end the repair stitching ¼ inch (6 mm) beyond the ends of the damaged area *(fig. 2)*.

If a corner of the pocket has torn away from the garment, reinforce the corner with extra stitches using the other corner as a guide *(fig. 3)*. Finish the repair by pulling the threads to the wrong side of the garment and knotting them.

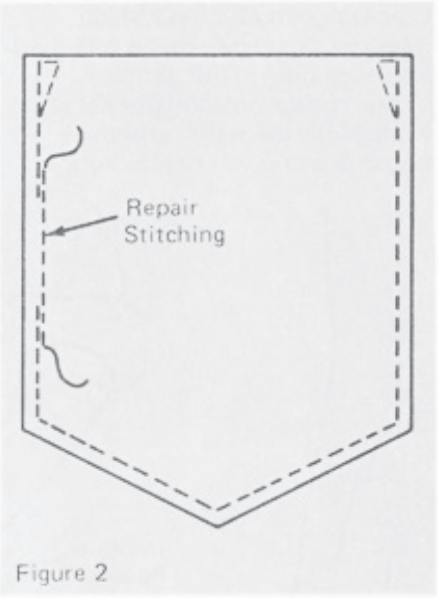


Figure 2

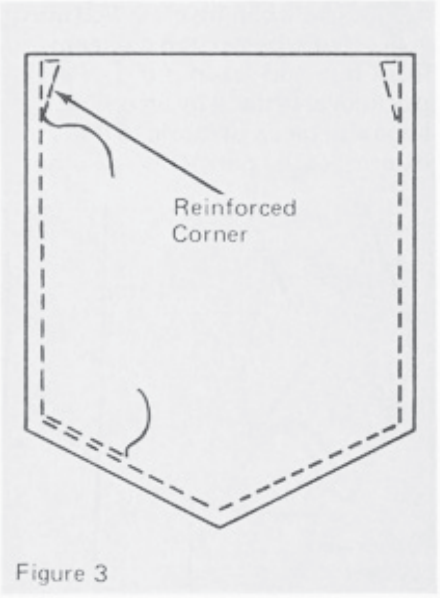


Figure 3

Invisibly stitched patch pocket. On some garments, particularly tailored jackets, patch pockets are attached without visible stitching. These pockets must be repaired by hand.

Work on the inside of the garment, ripping out lining stitches if necessary. Pin- or hand-baste the pocket in place. Replace the missing stitches, using a single, knotted thread and a small, even backstitch and catching the very edge of the pocket through the garment fabric *(fig. 4)*. You will be able to feel the pocket edge through the fabric with your fingers, so it's easy to know where to stitch. Be careful so your stitches don't show on the right side, and do not pull the stitches so tight that they pucker on the right side of the garment. Reinforce any top corners with extra stitches.

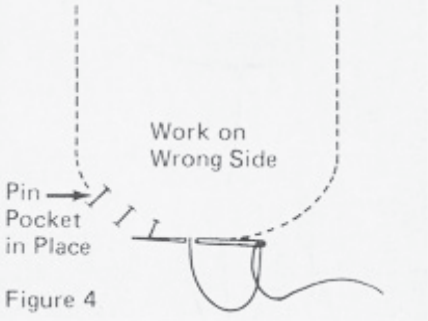


Figure 4

Set-In Pockets

Set-in pockets are reached through a slit in the garment. The slit may be covered by a flap, and it is often finished with a welt, a strip of fabric banding the edge.

Frequently the corner of a set-in pocket will tear out. Mend such tears as soon as possible after you notice them to prevent further damage. If just a few stitches are missing, replace them by hand from the right side of the garment. Use a single, unknotted thread, and take as many tiny hand stitches as necessary to strengthen the area.

Patching. If the fabric around the end of a set-in pocket is worn it must be patched before the ends of the pocket can be restitched. If the garment you're working on is lined, you'll need to unpick the lining stitches wherever necessary to gain access to the underside of the pocket. Also, rip out the stitching at the torn corner and along the bottom of the welt.

Cut an L-shaped patch, making sure the long edges measure at least 2 inches (5 cm) *(fig. 5)*. The patch should be large enough to

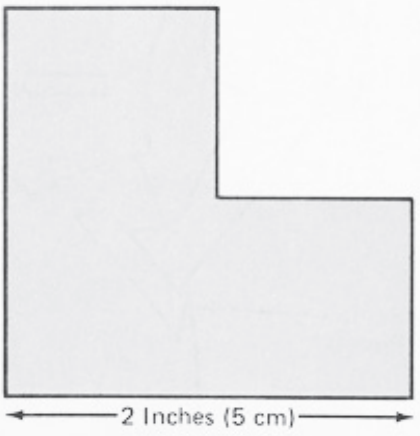


Figure 5

cover the worn area generously. Position the patch over the worn area so that its inner angle extends ¼ inch (6 mm) over the worn corner of the pocket. Using the oversewn patch technique (see Holes & Tears chapter), stitch around the four outside edges of the patch *(fig. 6)*. Do not catch any part of the inner pocket in your stitching.

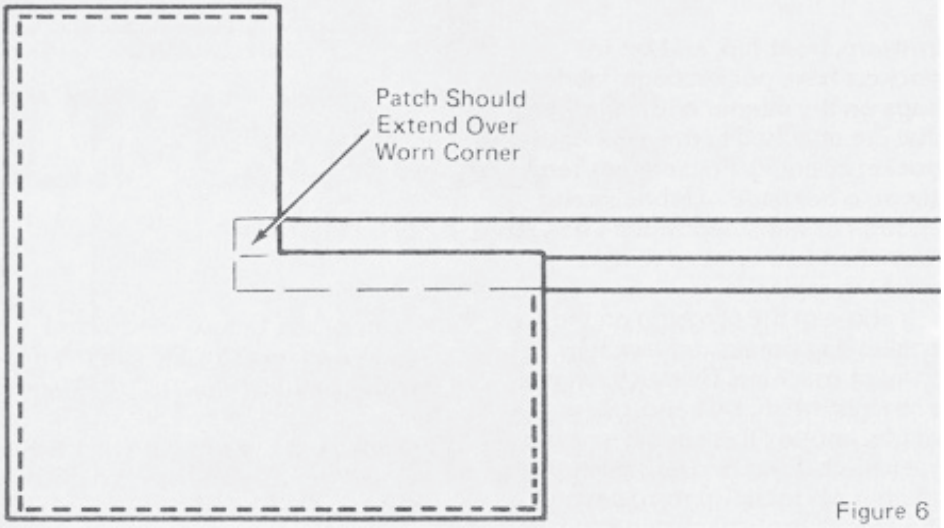


Figure 6

Working on the right side, make a ¼-inch (6 mm) clip into the inner corner of the patch. Turn under a ¼-inch (6 mm) vertical fold; tuck the ends of the welt or welts behind this edge and catch everything securely in place with small diagonal hand stitches, using a single, knotted thread *(fig. 7)*.

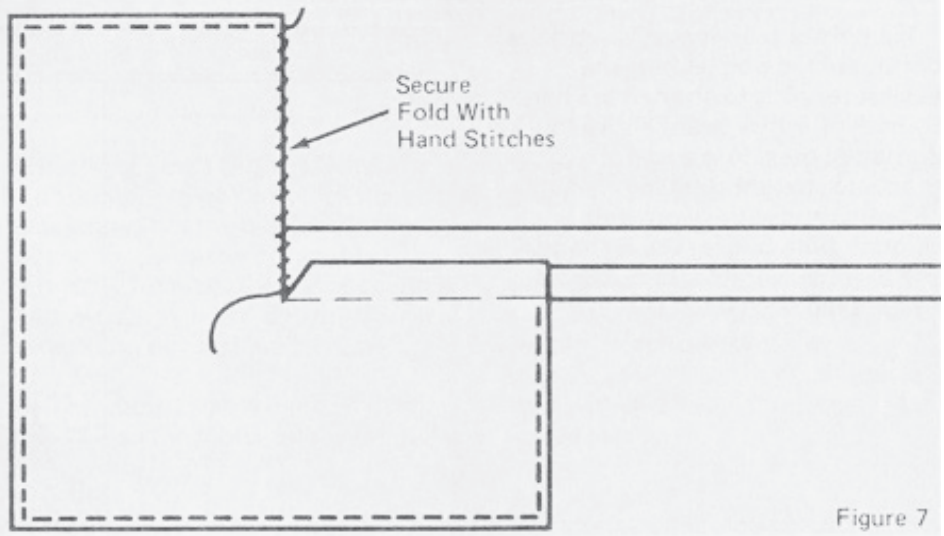
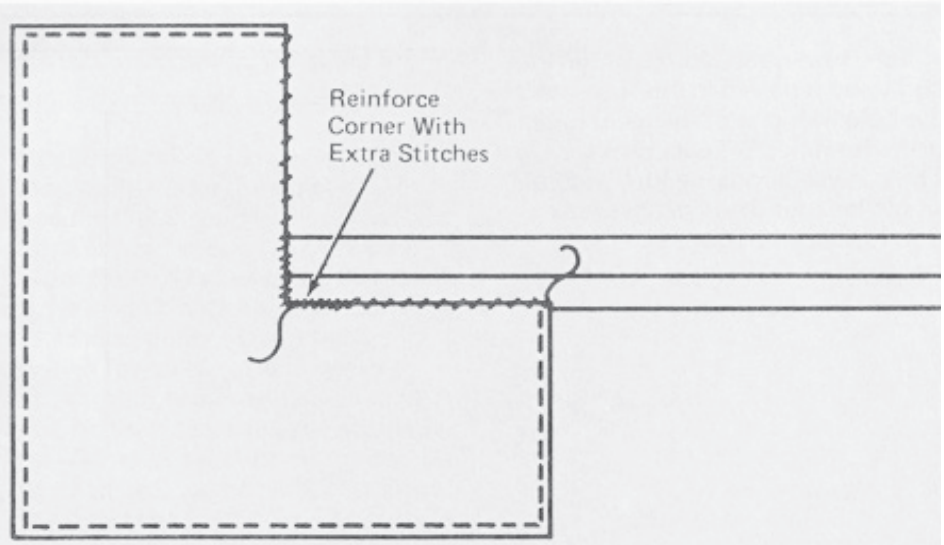


Figure 7

Turn under a ¼-inch (6 mm) horizontal fold, and catch the fold to the lower welt of the pocket by hand as above. Reinforce the inner corner with extra stitches *(fig. 8)*. Replace any other missing stitches along the edges of the pocket, making the corner secure.

Lightly steam-press the repair area, using a pressing cloth to protect the right side of the fabric.



Pocket Bags

In-seam, front-hip, and set-in pockets have pocket bags, fabric bags on the interior of the garment that are attached to the exterior pocket opening. Pocket bags rarely seem to be made of fabric strong enough to withstand much wear, so they often tear or need to have stitching replaced.

If some of the stitching on the pocket bag breaks, replace it by hand or machine. By machine, use a straight stitch. By hand, use a single, knotted thread and an even backstitch. Start and end the repair stitching ¾ inch (20 mm) beyond the area of broken stitching *(fig. 9)*.

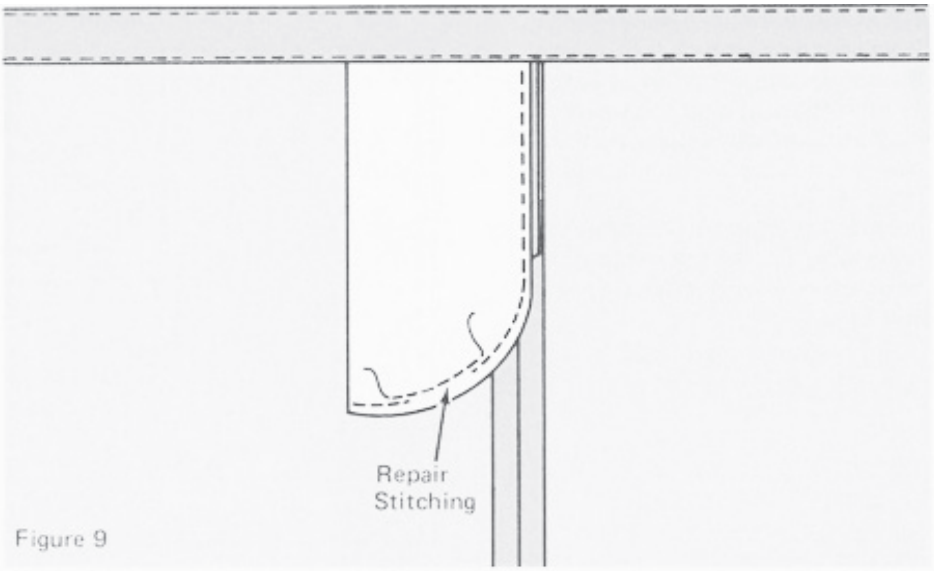


Figure 9

If a hole or tear occurs toward the bottom of the pocket bag, the easiest repair is to shorten the bag by making a new seam above the damaged area. Run a line of machine straight stitching ½ inch (13 mm) above the worn area through both bag layers. By hand, use a single, knotted thread and a small, even backstitch *(fig. 10)*.

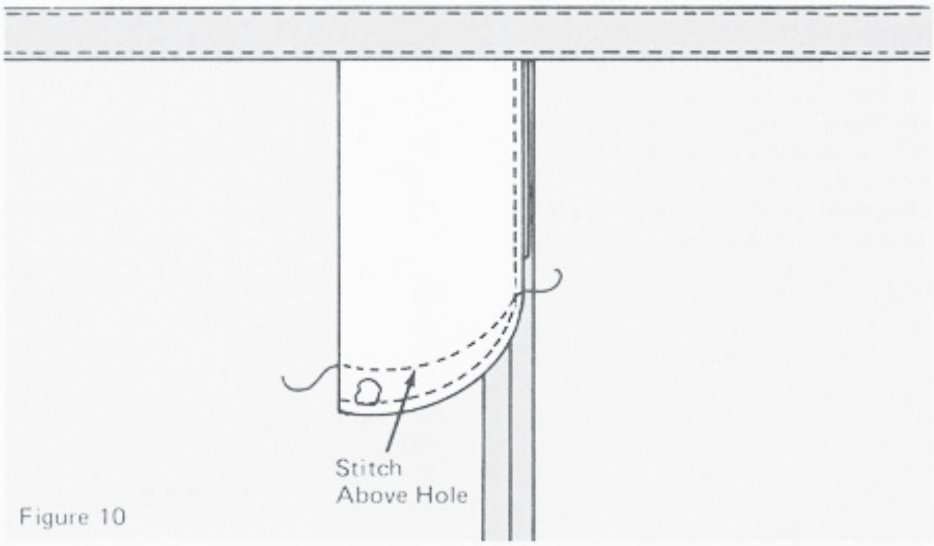


Figure 10

If the hole occurs too high on the bag to be repaired in this way, patch the hole with one of the techniques from the Holes & Tears chapter. The easiest technique for this repair would be an iron-on patch made with fusible web *(fig. 11)*.

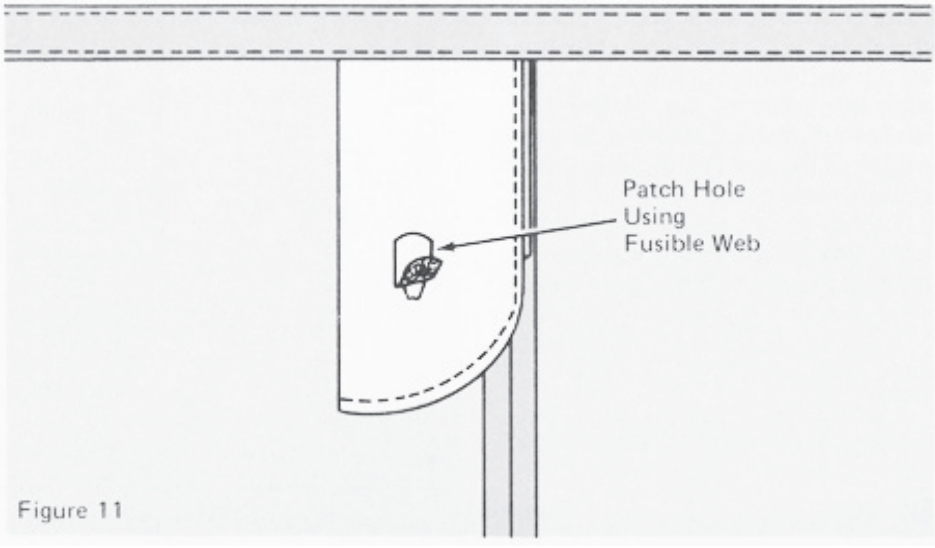


Figure 11

How to Use Solar

This chapter explains the basics of solar power. You'll learn how to calculate your electricity needs and connect a basic system. You don't need to spend tens of thousands of dollars on an expensive rooftop system. A simpler setup can work well, and it could save your life during an emergency.



How much do you need?

The average American household uses 30kWh of electricity a day. It helps to think in terms of appliances and watt-hours. A central air conditioner uses anywhere from 3-5 kWh. A window unit uses about 300-500 Wh. A refrigerator uses about 200 Wh per hour. A chest freezer uses 100-400, and a stove uses 2-5 kWh. It adds up fast.

How much can you get?

A typical rooftop solar setup can produce about 20-40 kWh per day, depending on the weather. They can cost tens of thousands to install. Smaller, portable setups produce much less, but you can still generate enough to run some essential equipment if you develop a strategy.

The Basics of Electricity

We measure electricity in amps, volts, and watts. Amps refers to the amount of electricity flowing through a system. Voltage refers to force or velocity. We multiply amps by volts to get watts, the total load. It's important to know, because different equipment requires different voltage.

Volts x amps = watts
Watts/amps = volts
Watts/volts = amps

For example: You have to configure solar panels to deliver a specific voltage to run a solar charger or generator. Too much, and you'll damage the system. Not enough, and the system won't run. The same goes for amps. If your appliances demand too much, it can cause hazards. Plus, solar equipment is rated for maximum volts, amps, and watts.

Is there a quickstart?

It's easy to get overwhelmed when you start learning about solar panels, charge controllers, battery management systems, and inverters. Fortunately, there's a fast way to get solar that's much simpler (and safer). It's called a solar generator. It combines all the equipment you need in one package. Just configure your solar panels and plug them into the generator.

How to choose a generator

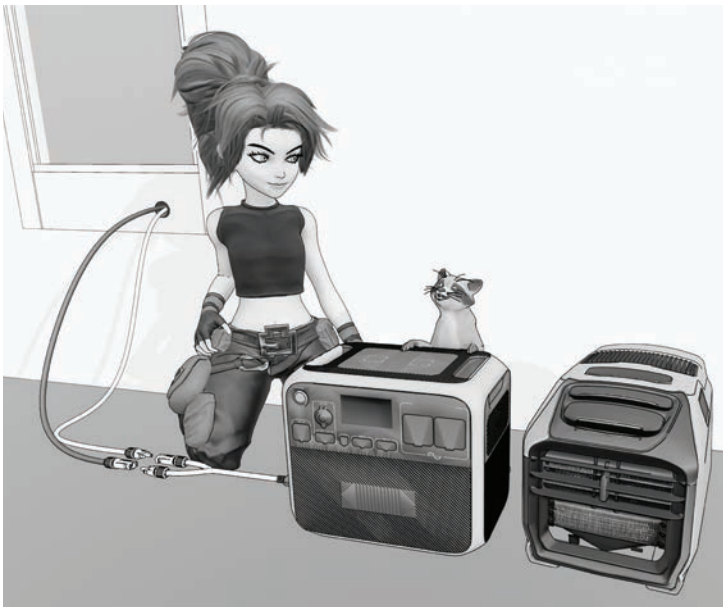
Several companies sell solar generators: Bluetti, Jackery, Ecoflow, Renogy, Anker, and Goal Zero. Some are expandable, which means you can add batteries to them to increase your capacity.



A generator is basically an "all-in-one" unit that combines all the components in a DIY system. They're easier and safer. They've also gotten a lot more affordable over the years, rivaling the cost of complete DIY setups.

Generators run from a few hundred watts all way up to several thousand in terms of electricity storage. Think about your needs during different types of emergencies. For example, if you need to power a portable AC during a grid outage, that would require a generator with at least 1-2 kilowatts of capacity.

More on Solar Generators



Most companies sell two different types of backup units. They sell "power stations" or "generators." And they sell "batteries." You're going to need a generator/station first, because that's what you can actually plug your appliances and devices into. You can't plug your stuff into a battery. The batteries expand your main station/generator.

Look at the watt-hours (Wh) listed on the backup unit. It's usually displayed right under the model's name. Now look at the labels on your devices. A phone draws 5-30W. A laptop draws 30-100W. A mini fridge draws 50-100. A chest freezer draws 50-200W. A window AC unit draws 400-900W. A portable heater/cooler draws 900-1,500W.

The heavier appliances list a startup surge, but it's often scrambled in electrician's code. The quick interpretation: It's usually 2-3 times the operating wattage when you first turn it on, only for a few seconds.

Take out a pen and paper. Grab a calculator. Check the specs on your gear or look them up online. Write down your loads. Add them up. That's your wattage goal for each hour you go without power.

Companies that sell backup kits have replaced the ordinary term "surge power" with a new gimmick called "lifting power." Other companies use phrases like "X-Boost," "Smart Boost," and "SurgePad."

Output refers to how much power your loads can draw before the backup shuts off for safety reasons. For example, a generator with an output of 3,840W can handle your combined appliances and devices at 3,840W continuous operation with no problems, including their startup surge (defined below). In short, this describes how much stuff you can plug into your backup before it shuts off. For safety, try to limit this to 80 percent based on electrical codes.

Heavier appliances like window AC units and fridges draw 2-3 times their operating wattage on startup. So a unit that needs 500W when it's cooling will probably draw 1,500W for a few seconds when you first turn it on. A newer backup can handle that surge, even while powering a few other devices.

Sometimes, a company will manipulate its true surge power by calling it something else and then inflating it. The new "lifting power" isn't always a true surge power. It's simply the backup manipulating the load into starting up with lower wattage. That's very dangerous for medical equipment and other devices. True lifting power only applies to heavier backups in the 2-4kWh range and beyond. With smaller backups and portable power stations, it's misleading. True surge power is almost always just double the normal output rating. So if the "lifting power" is more than double the normal output...

If you plan on adding solar panels, input capacity matters. Some smaller backups only accept 1kW of input from a wall or a solar panel. Others accept more, like up to 19.2kW. Try to find a backup system with at least 2 KW input that can handle the larger portable solar panels coming out.

Backup Cheat Sheet

Brand:
Model:
Chemistry Type:
Cycle Life:
Bypass:
Weight:
Dimensions:
Capacity:
Input:
Output:
Surge:
Expandable:
Other Features:

Brand:
Model:
Chemistry Type:
Cycle Life:
Bypass:
Weight:
Dimensions:
Capacity:
Input:
Output:
Surge:
Expandable:
Other Features:

Brand:
Model:
Chemistry Type:
Cycle Life:
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Dimensions:
Capacity:
Input:
Output:
Surge:
Expandable:
Other Features:

Brand:
Model:
Chemistry Type:
Cycle Life:
Bypass:
Weight:
Dimensions:
Capacity:
Input:
Output:
Surge:
Expandable:
Other Features:

How to Match Solar Panels

Companies also sell generators and solar panels in premade kits. Every generator has a maximum PV (solar) input measured in watts. For many middle tier generators, it's about 1,000W.

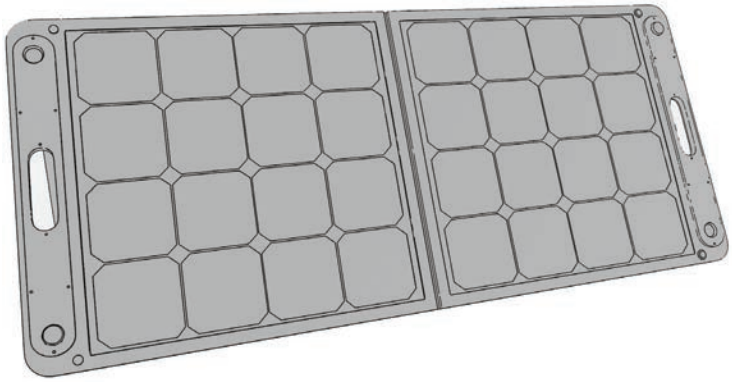
Most foldable, portable solar panels generate 200-400 watts. So, many kits come with one generator and two panels.

It's okay to connect more solar panels than a generator's max wattage. It just won't draw the power. Some people deliberately "over panel" their systems to compensate for poor sunlight or to maximize solar input at the beginning and end of the day, when it's less bright.

You want to watch out for your amps at the other end, with how many devices you connect.

Solar Panel Specs

Solar panels also have technical specifications that matter when you're connecting more than a couple into one system. Here they are:



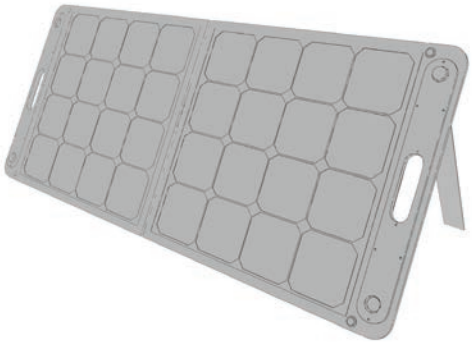
Pmax (Maximum Power Point): The max wattage a panel generates under ideal conditions.

OCV (Open Circuit Voltage)

Vmp (Voltage at Max Power)

Isc (Short Circuit Current): Use this to size fuses for panels in bigger setups.

Imp (Current/Amps at Max Power)



For example:

Pmax (Maximum Power Point): 350w

OCV (Open Circuit Voltage): 46.5V

Vmp (Voltage at Max Power): 37.5V

Isc (Short Circuit Current): 10.8 amps

Imp (Current/Amps at Max Power): 9.2 amps

This information tells us that we need a 15 amp fuse, and that we should connect the panels in parallel so we don't exceed the voltage range for most portable generators (12-60v). It will make sense in a minute...

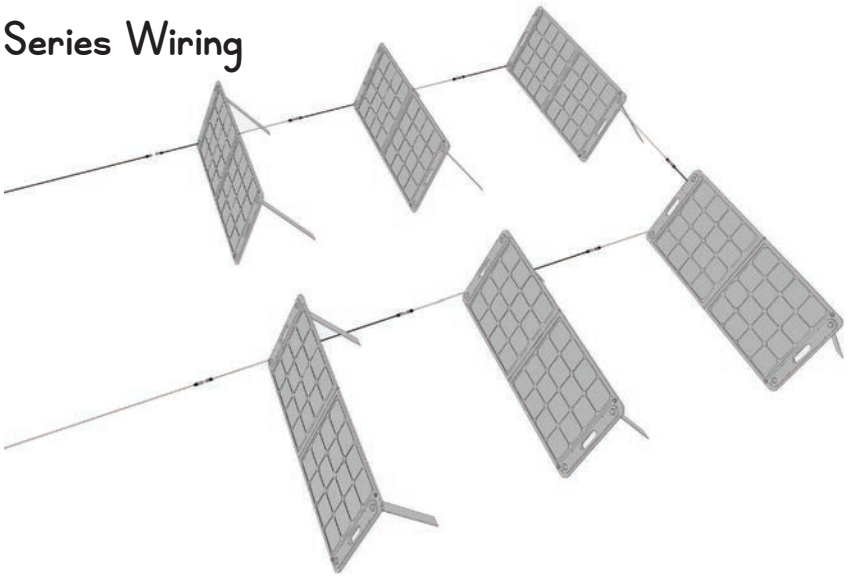
Series vs. Parallel Setup

You can hook up solar panels in two main ways: series and parallel. In series, solar panels add up or stack voltage as you connect positive to negative terminals. In parallel, they add up or stack amps as you connect positive-positive and negative-negative. Most of the time, you don't want to stack volts.

You can also hook up panels in series-parallel, discussed later.

Cables: MC4
Male and female connectors

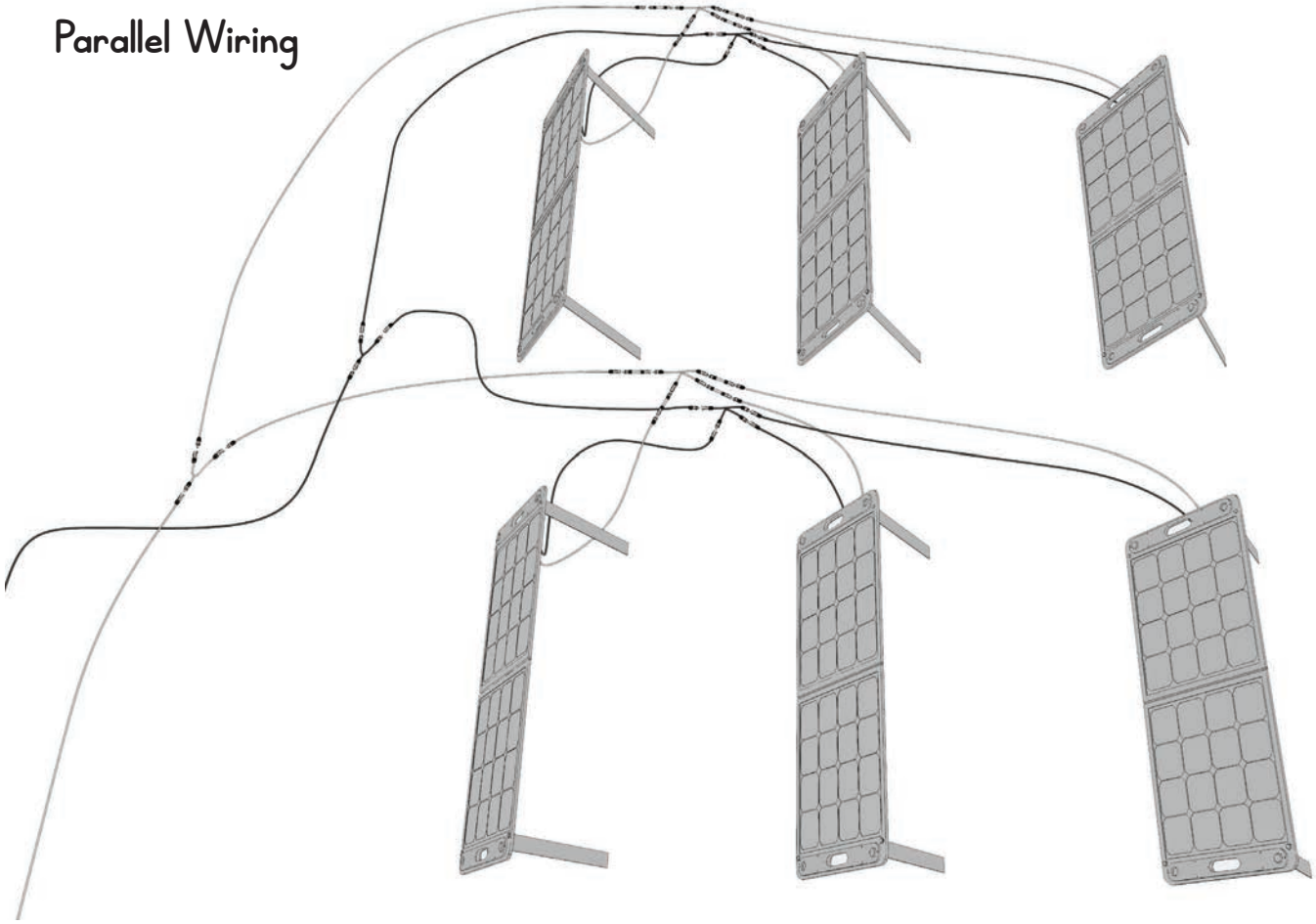
Series Wiring



Why Parallel?

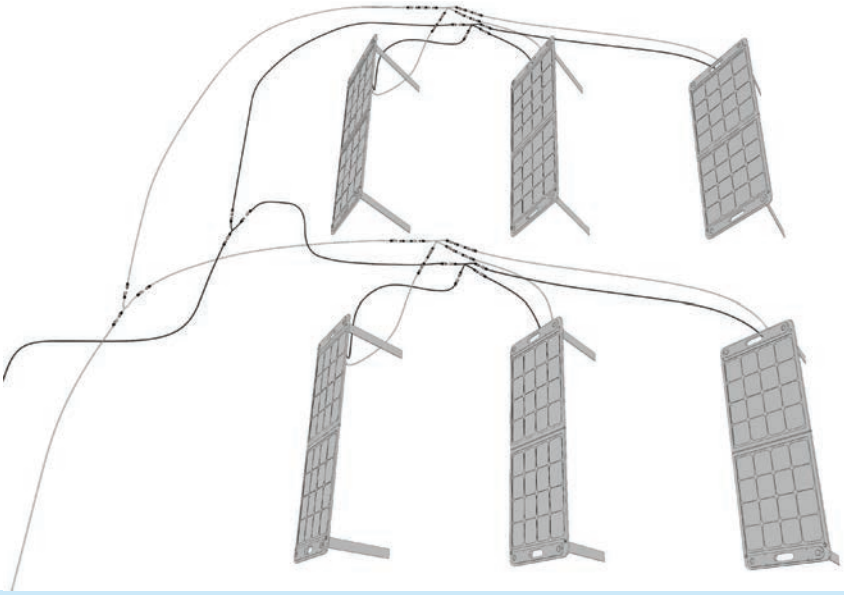
Most portable solar generators can't handle more than 60 volts, but they can handle plenty of amps. So you wire them in parallel. It requires more gear.

Parallel Wiring



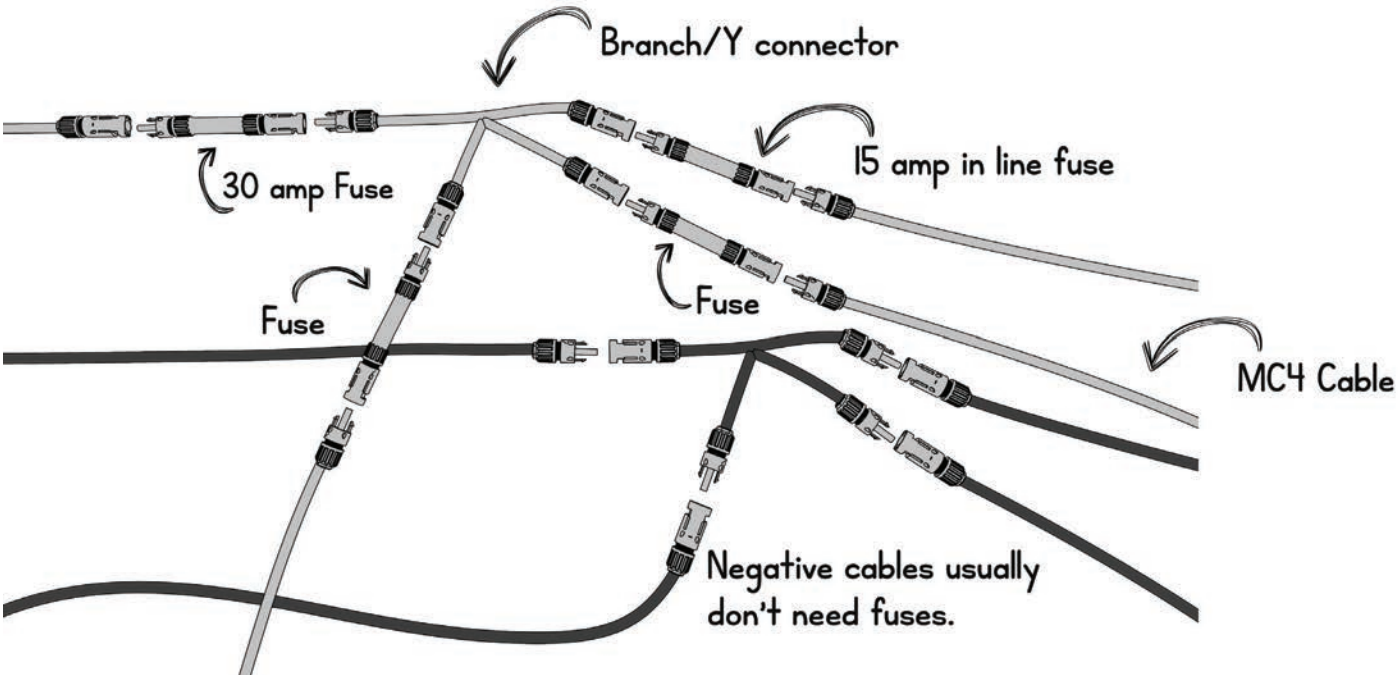
Parallel Setup in Detail

A parallel setup requires MC4 branch or y connectors, fuses, and extension cables. You're wiring all the positive wires together, and all the negative ones together, and feeding them into one positive and one negative cable. Those two cables run to your generator.



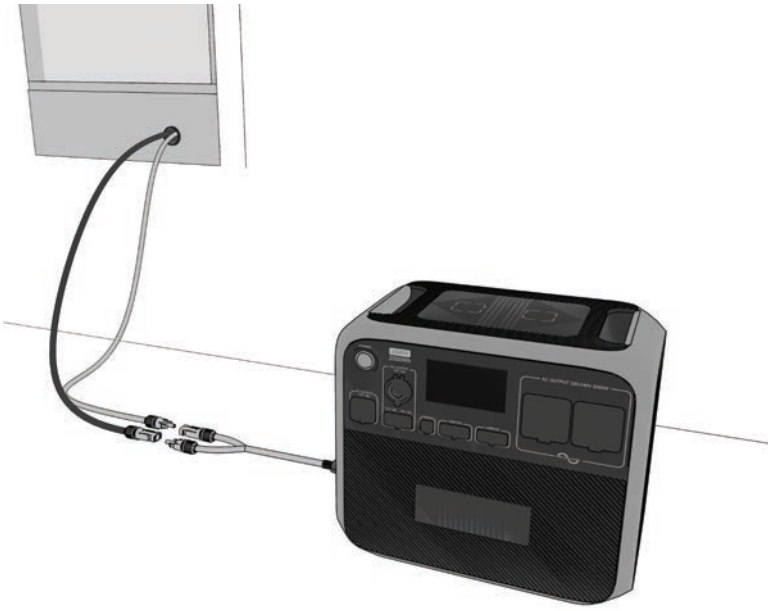
The Gear

Generally, you'll want to use 6-8 awg cable when you're connecting 3-4 solar panels. It handles 40-50 amps or better. Remember, 4 solar panels with 9-10 Imp connected in parallel generate roughly 40 amps. Lower awg means higher load tolerance, because it's thicker wire. For multiple panels, go with 8 awg or lower (bigger). The short circuit current (Isc) tells you what size fuse you need. Generally, it's 1.5x the short circuit current, or 15. It's not hard to find 15 amp inline fuses at most solar retailers. For extra safety, use a 30 amp fuse after the branch connector (3x10 amps).



Running The Cables Inside

To run portable solar panels inside your home, you'll have to get creative. Try making a passthrough panel. Find some rigid foam insulation board at a hardware store. Cut it to fit a window. Use a hole saw to drill a 2-3/8 or 3-3/8 inch hole through it. That will fit the outside diameter of Schedule 40 PVC conduit pipe.





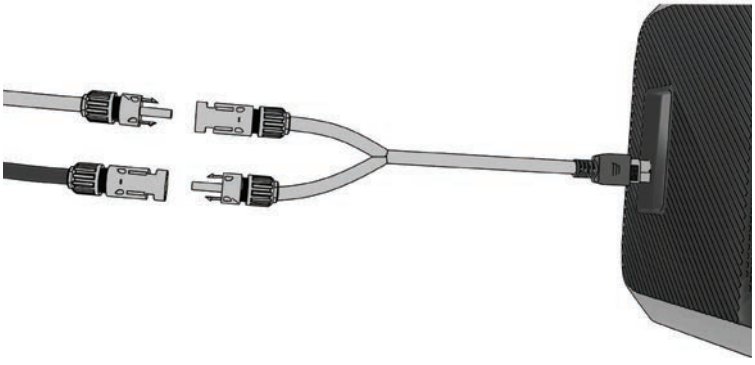
Now you can run the cables inside while keeping the elements and the bugs on the outside. To secure the window against intruders, use a security bar.

For maximum seal, run some weather stripping or rubber tape inside the pipe. The cables should come through snug, but not smothered.





Finally, you'll connect the MC4 cables to the adapter(s) that came with your generator. The XT60 is a popular one.



Hooking Up Batteries

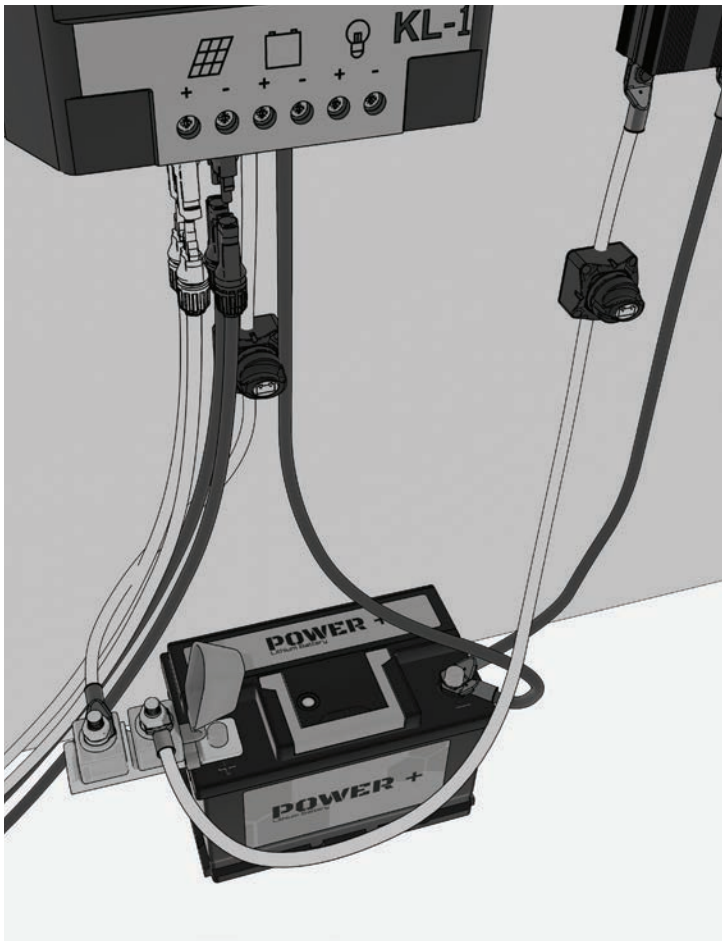
Solar generators offer the ultimate simplicity and safety, but you can also rig your own battery system if you want more control. They can also cost less. To do that, you'll need to get a solar charge controller and an inverter at minimum, as well as a battery.



The Gear

Most experts recommend LifePO4 batteries. They're the most durable, and they last the longest. You're also going to need fuses and battery disconnect switches. Experts differ on where exactly to place fuses and disconnect switches, but you'll see a common setup in the illustrations. Marine-rated battery fuses (MRBF) offer a good mix of safety and affordability. You can get them as single or double-pole. They allow you to mount a number of connections directly to your battery terminal.

When you're working with 200-300 amp systems, use 4/0 (0000) AWG cables for maximum safety, although 2/0 (00) AWG cable can handle roughly 200 Amps.



Sizing Fuses

Divide your inverter's total power rating by .9 to get its true draw. Then divide that by your battery's voltage, then divide it again by the number of batteries in your system. Multiply that by 1.25 twice for safety and battery aging.

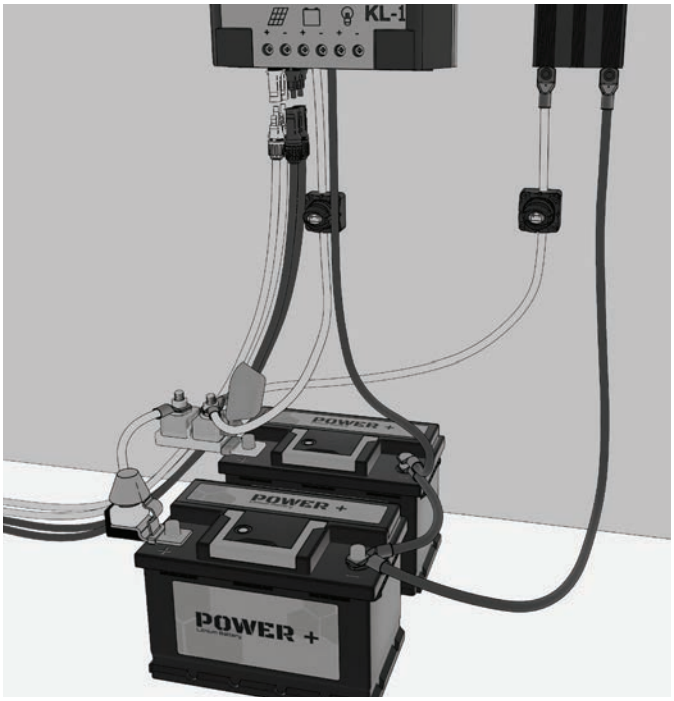
For example:

2,000W/.9 = 2,222W
2,222W/12V = 185 Amps
185/2 batteries = 92.5 Amps
92.5 x 1.25 = 115.63 Amps
115.63 x 1.25 = 144.53 Amps

If you're using one battery, you need a 200 amp fuse. If you're using 2 batteries, you need a 150A fuse, and so on.

Connecting Multiple Batteries

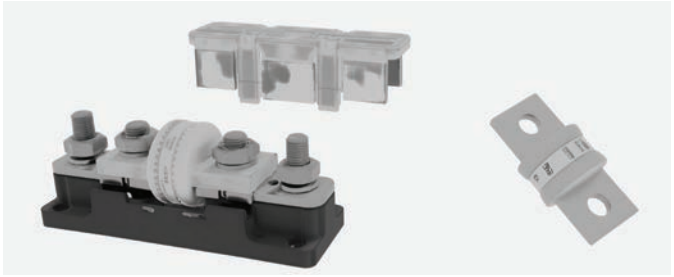
You can generally connect up to 3-5 batteries without having to move up to Class-T fuses. With 300 amp/12-24 volt batteries, that's enough to run appliances and even small window units. More complex setups require more extensive knowledge.



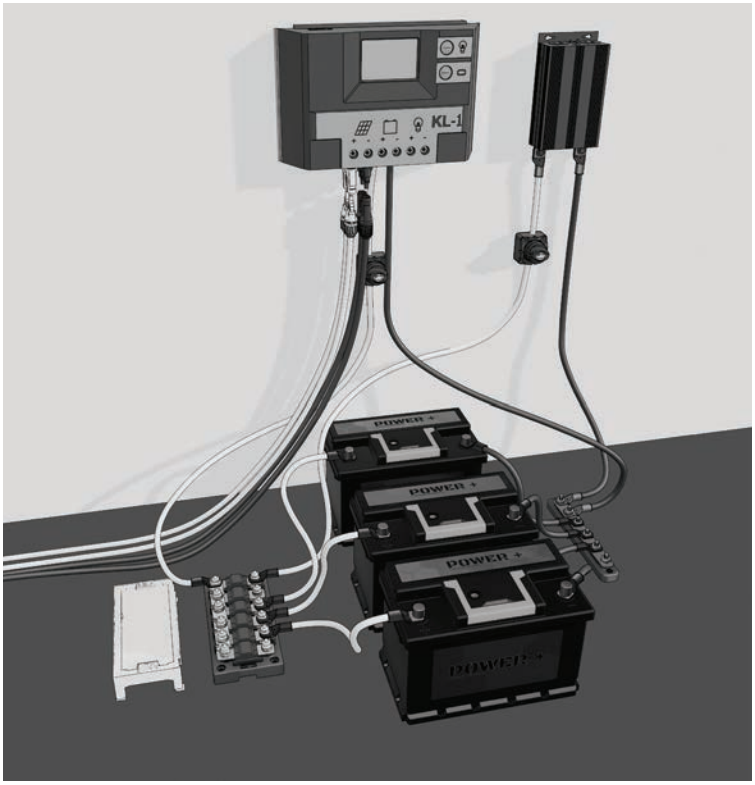
Newer systems often come with built-in PV disconnect switches. If yours doesn't, you'll want to add one for safety in addition to the battery switches. Just connect your cables, then connect the switch to your controller.



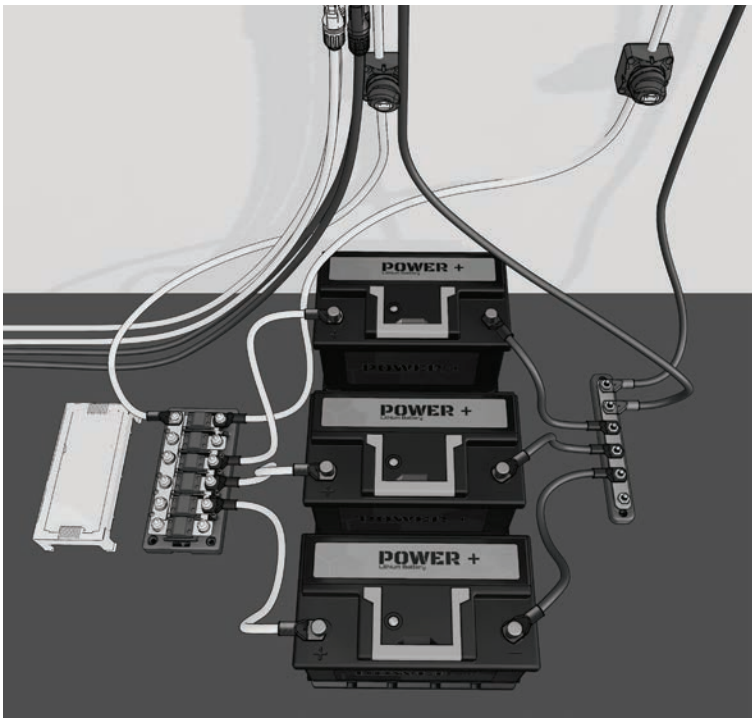
If you're wiring 3 or more batteries or larger ones (24V or above), it's also a good idea to get Class-T fuses that can handle larger currents and surges.



It's also a very good idea to run the negative battery terminals to a busbar. Doing that maximizes safety.



If you're connecting 3 or more batteries, it's recommended you upgrade to a fuse block. The controller runs to one side. You connect the battery and inverters to the other.



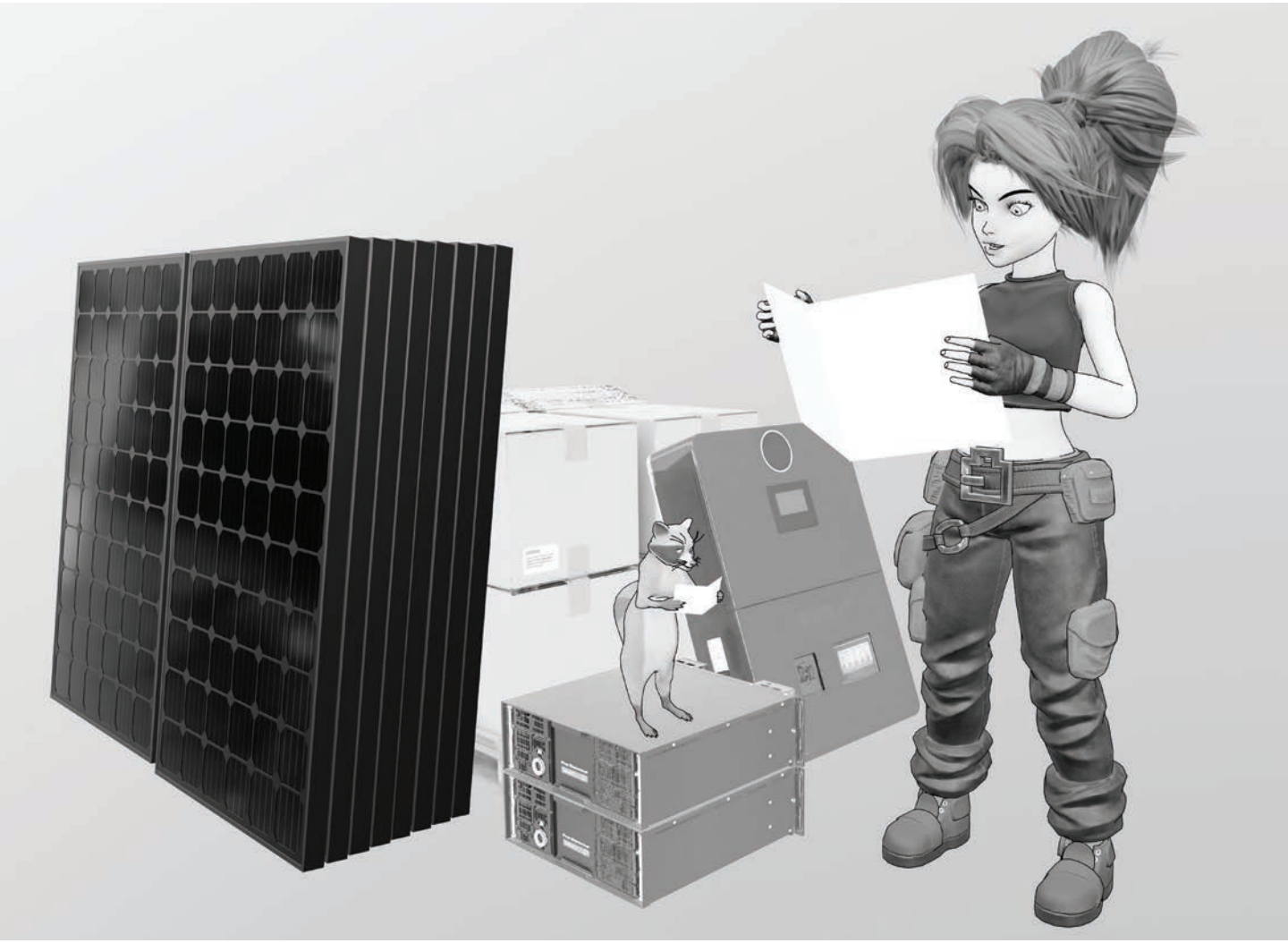
When to Go Full Solar

You might need a full-sized rooftop solar system for a variety of reasons beyond personal comfort. You might have a medical condition. You might be taking care of a vulnerable person. You might be raising a family. Children are generally more vulnerable to heat stress and exposure than adults. You might have a very good reason for wanting a larger system.

When to Go DIY

Several companies sell complete DIY solar kits, which cost a lot less than hiring a rooftop solar company. But DIY kits come with several risks. Look at reviews and complaints for these companies. Many customers report damaged or missing parts, absent or incomplete instructions, and pitiful support after the initial sale. On top of those problems, these companies often recommend you hire a licensed electrician or master installer to help you anyway, or at least check over your work. That means you have to find a reliable professional willing to work with you. Most counties and states won't let you operate a large system without an inspection. Disregarding local codes and regulations could cause serious injuries or property damage. Frankly, people have burned down their homes trying to save money on large DIY systems.

Consider all the extra time, stress, and safety issues. If you don't have much time or bandwidth in the first place, then it's a net loss.



Can You Really Live Without Electricity?

Some preppers advocate going without electricity altogether. That's just not doable for many of us in the suburbs or renting in bigger cities, with jobs and other responsibilities. We can scale back our needs a lot. We can hang-dry laundry. We can handwash clothes. We can cook food with solar ovens. We can use strategies to minimize our needs for heat and air conditioning. But even a composting toilet might require a fan to vent odors. You could cut your energy needs to a few kWh a day, compared to the average 30 for a typical American household. That doesn't mean you need to go without it entirely.

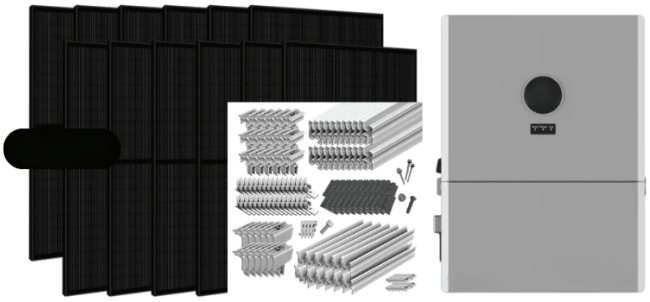


You Don't Need a Big System

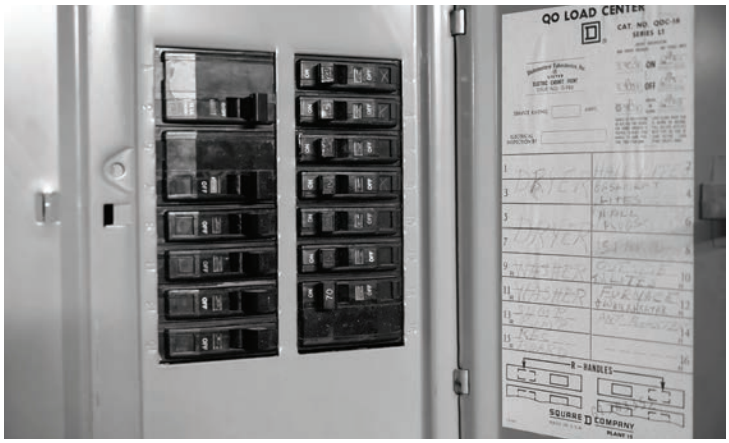
Many people think they have to power an entire home when they buy a rooftop system. That's not true. You can back up parts of your home, and it's a good way to save money. You choose which rooms, outlets, or appliances you need during a power outage. Then you size your system to those needs. A professional installer will ask you to fill out something called a "load sheet." Look at your home electrical panel. See what breakers connect to the electric loads in your house (Air conditioner, HVAC, etc). Decide your critical loads, and ask the installer to connect those to your backup battery. You could decide to power AC and one room only. Going this route, you could cut the install cost in half. From there, you can finance. Maybe it's not ideal, but it's doable.

When to Go Pro

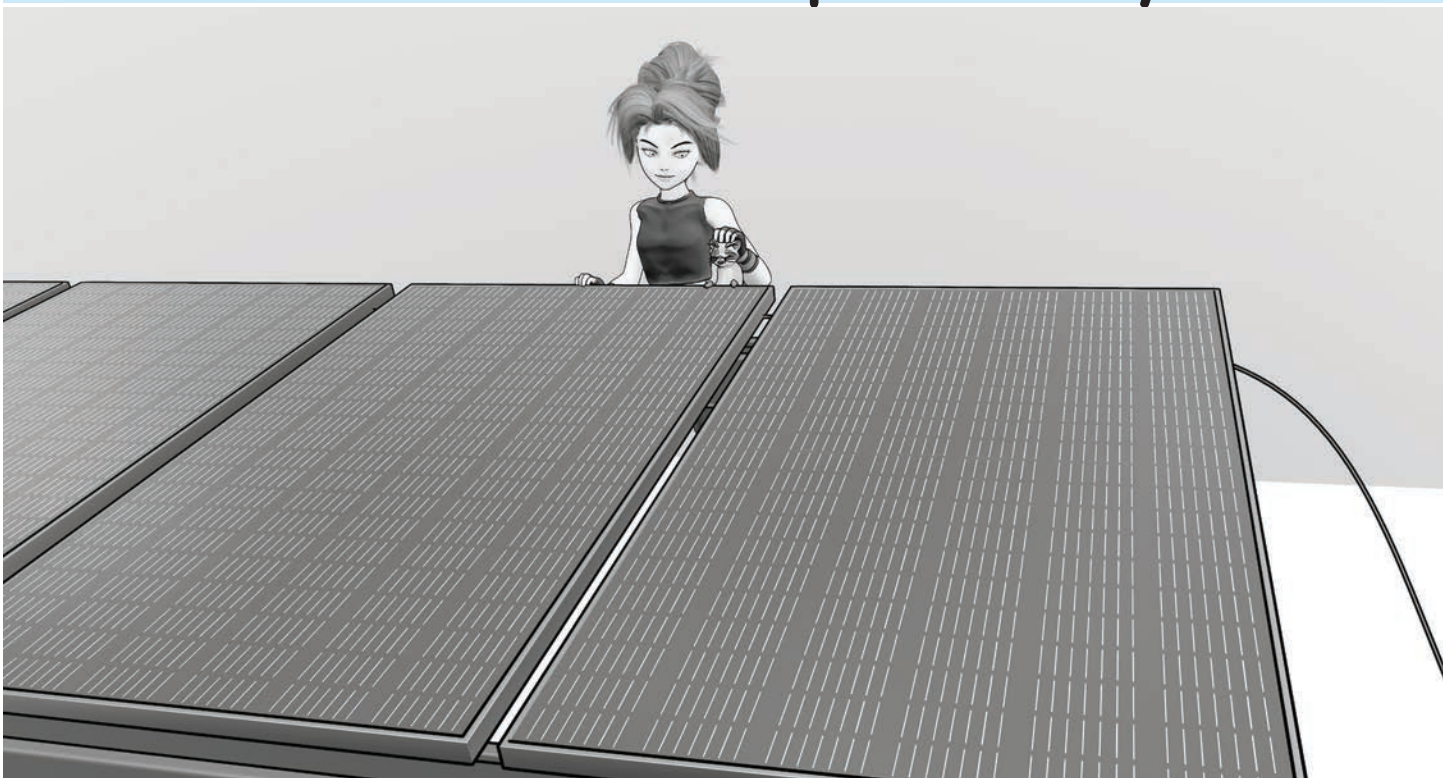
Ads for DIY solar often exaggerate the cost of hiring professionals. An 8-10 kW system with one backup battery should run around $30-40,000. These systems can provide 90-100 percent of an average 2,000-square foot home's electricity needs. A similar DIY kit would cost $15-20,000 just for the equipment. Then you have to install it.



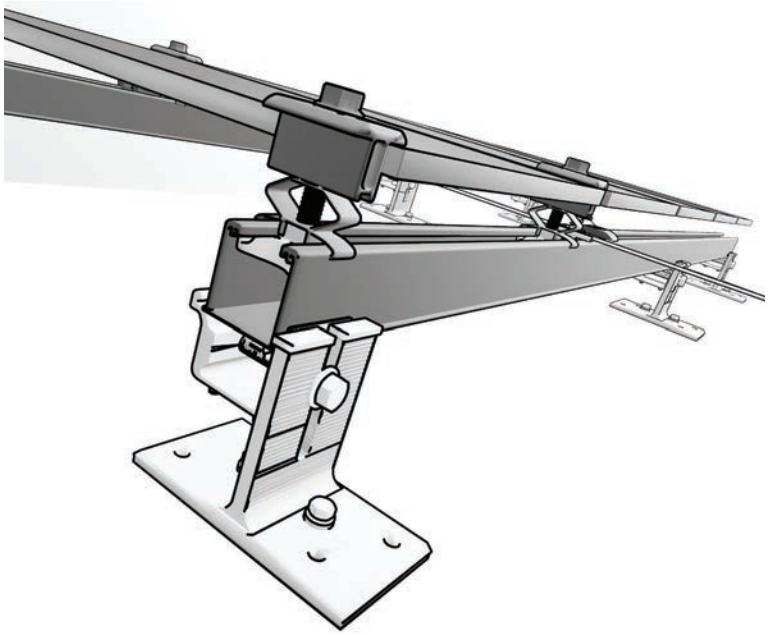




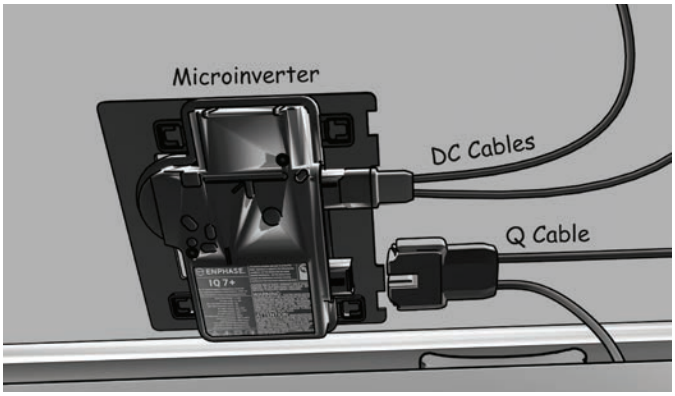
Breakdown of a Rooftop Solar System



It's worth knowing how a basic rooftop solar backup system works in detail, even if you never plan to climb up on your roof. You'll appreciate the hardware, and you'll make better decisions if you ever decide to get one installed. It does you no good to remain mystified by the process.

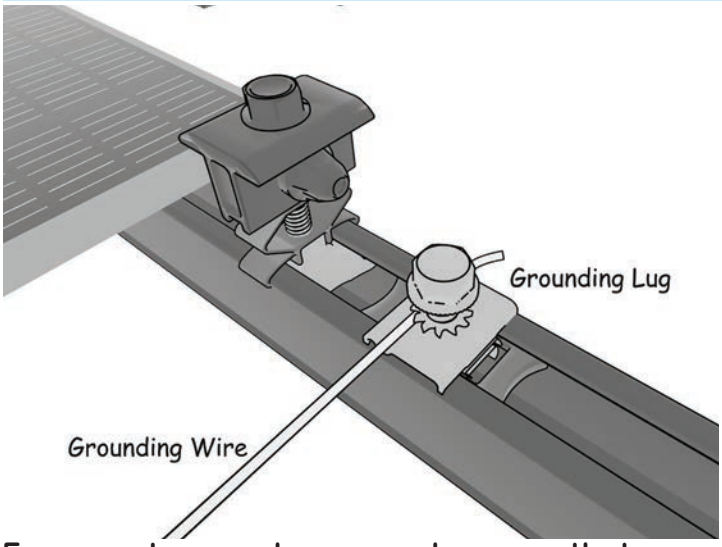


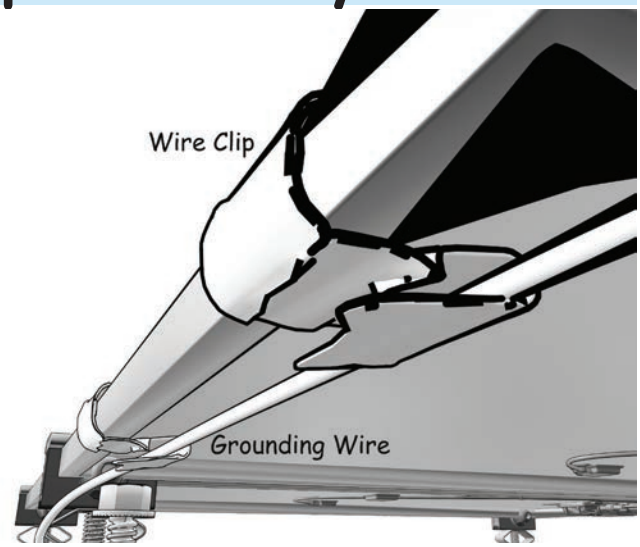
For starters: The roof mounting system. More companies are going with systems like the Unirac Umount. You don't have to cut through shingles anymore. Their rail attachments bond with the shingles. All you have to do is bolt them down to the rafters through the shingles, and sometimes add some caulk or bonding agent.



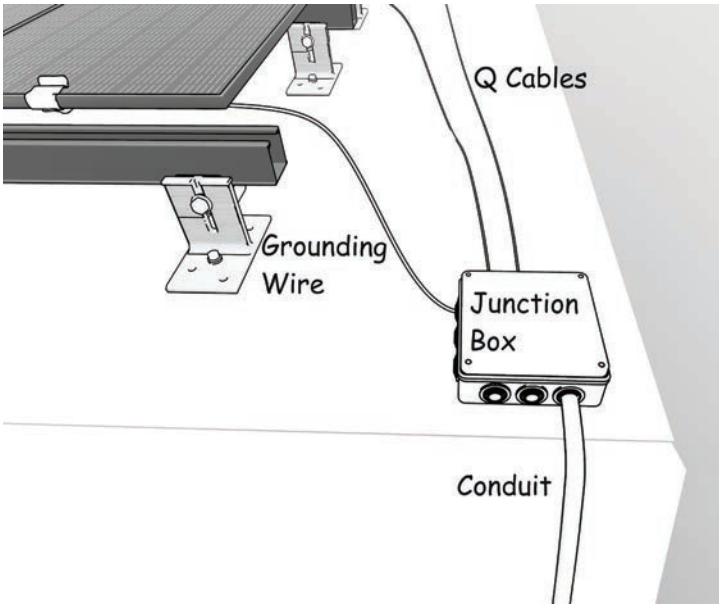
Many companies make solar panels with microinverters premounted. It makes the job extremely easy. Installers simply connect a row of panels with Q cables, in daisy-chain fashion. The microinverters convert the panel's DC electricity into AC, and each panel functions independently. If one panel goes down, it won't impact the others. The Q cable runs through the mounted rack channels, where it's kept out of sight.

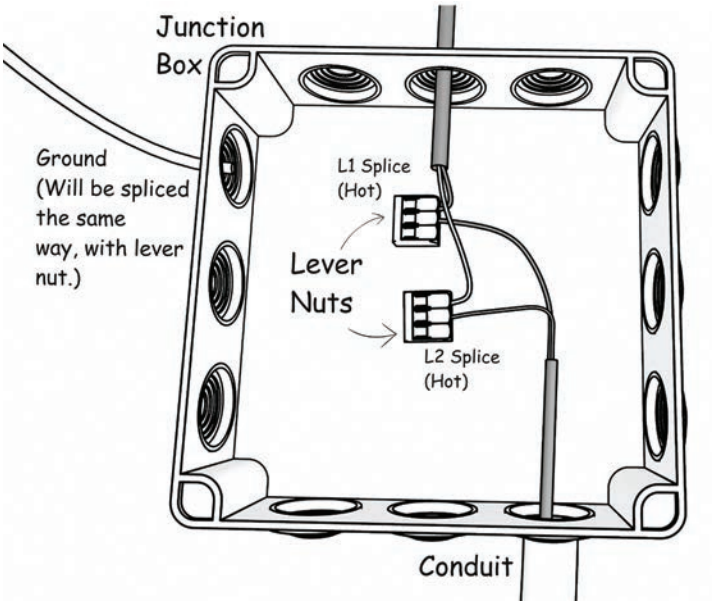
Breakdown of a Rooftop Solar System





Every system needs a grounding wire that runs excess current away from the panels and railing into a panel, then to the ground. Here, you see a 6-gauge copper wire secured to the rail with a grounding lug. It runs through grounding lugs on every rail. Then it runs along the bottom row of panels, fastened with wire clips. The clips keep the copper wire from touching the roof or the panels. Finally, the wire terminates in your roof's junction box. That's where it's spliced (joined) with a longer insulated grounding wire that runs all the way to your combiner box, then your transfer switch.

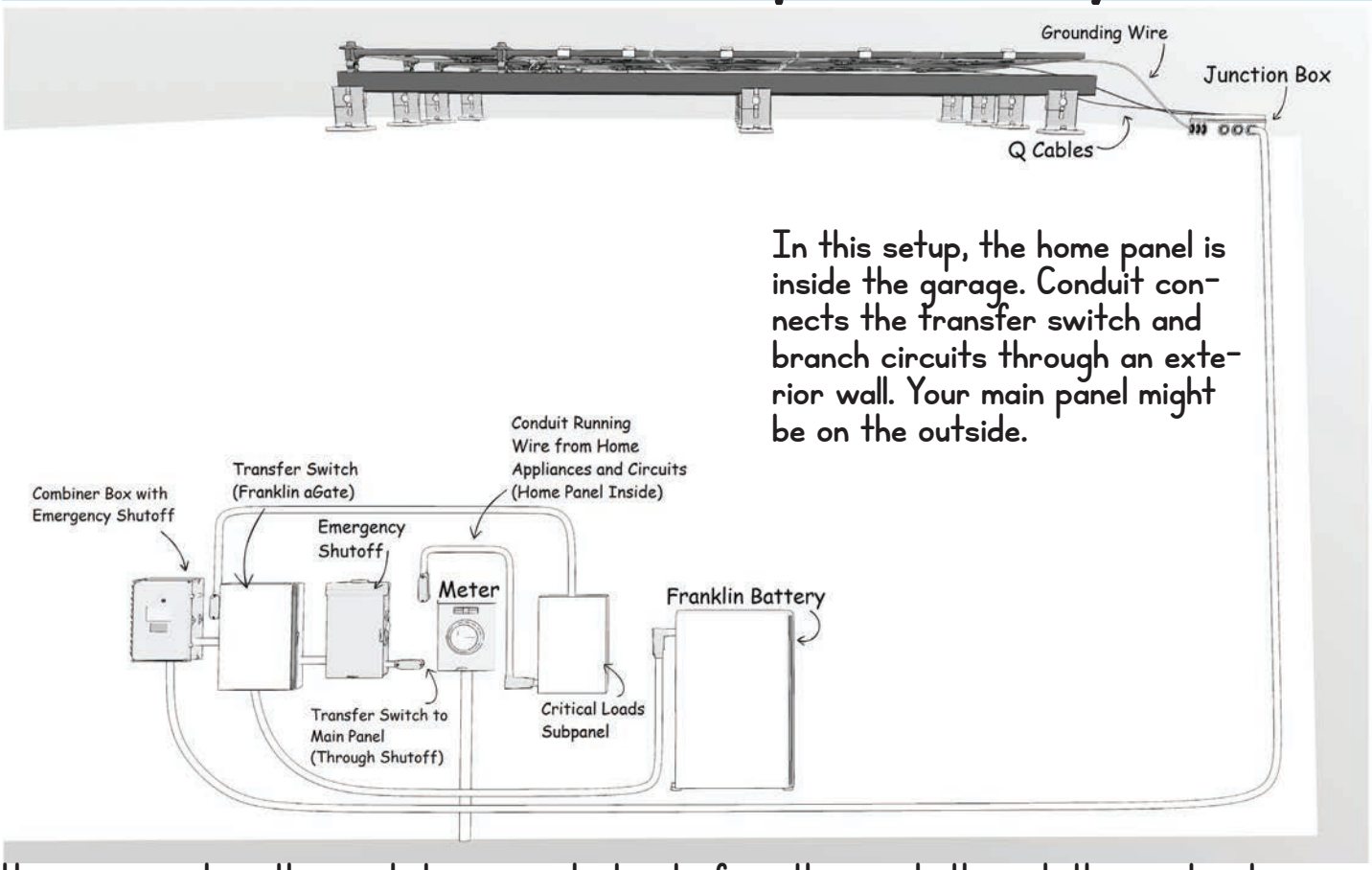




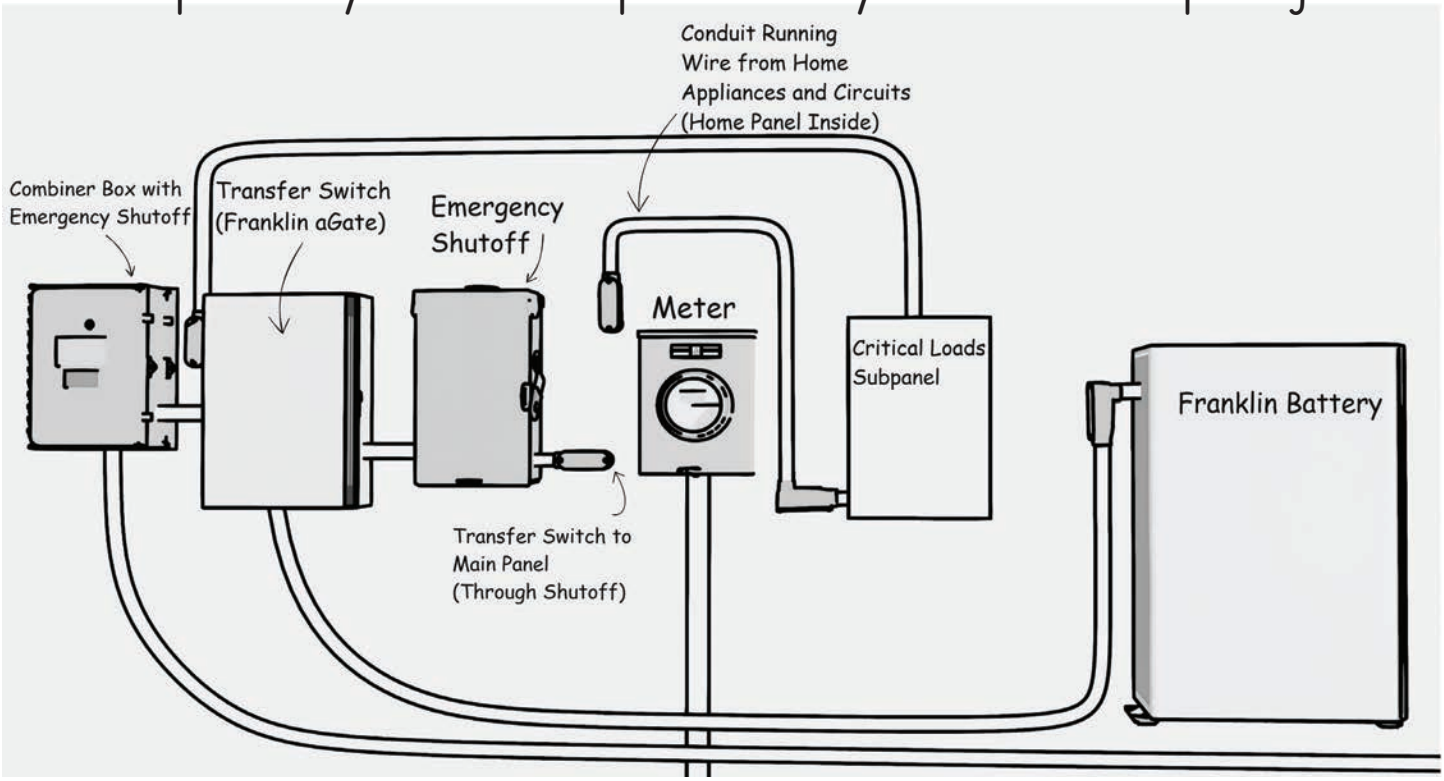
Everything comes together in the junction box. That includes the Q Cables. Installers also splice these with devices called lever nuts. Q Cables only carry 2 hot wires.

Here, you see LI (hot) and L2 (hot) from the Q cable spliced with the THWN wire, which stands for thermoplastic, high heat and water resistant with nylon coating. It's a thicker wire insulated and rated for outdoor heat and wet weather. This cable also runs through metal conduit, all the way to PV system and transfer switch.

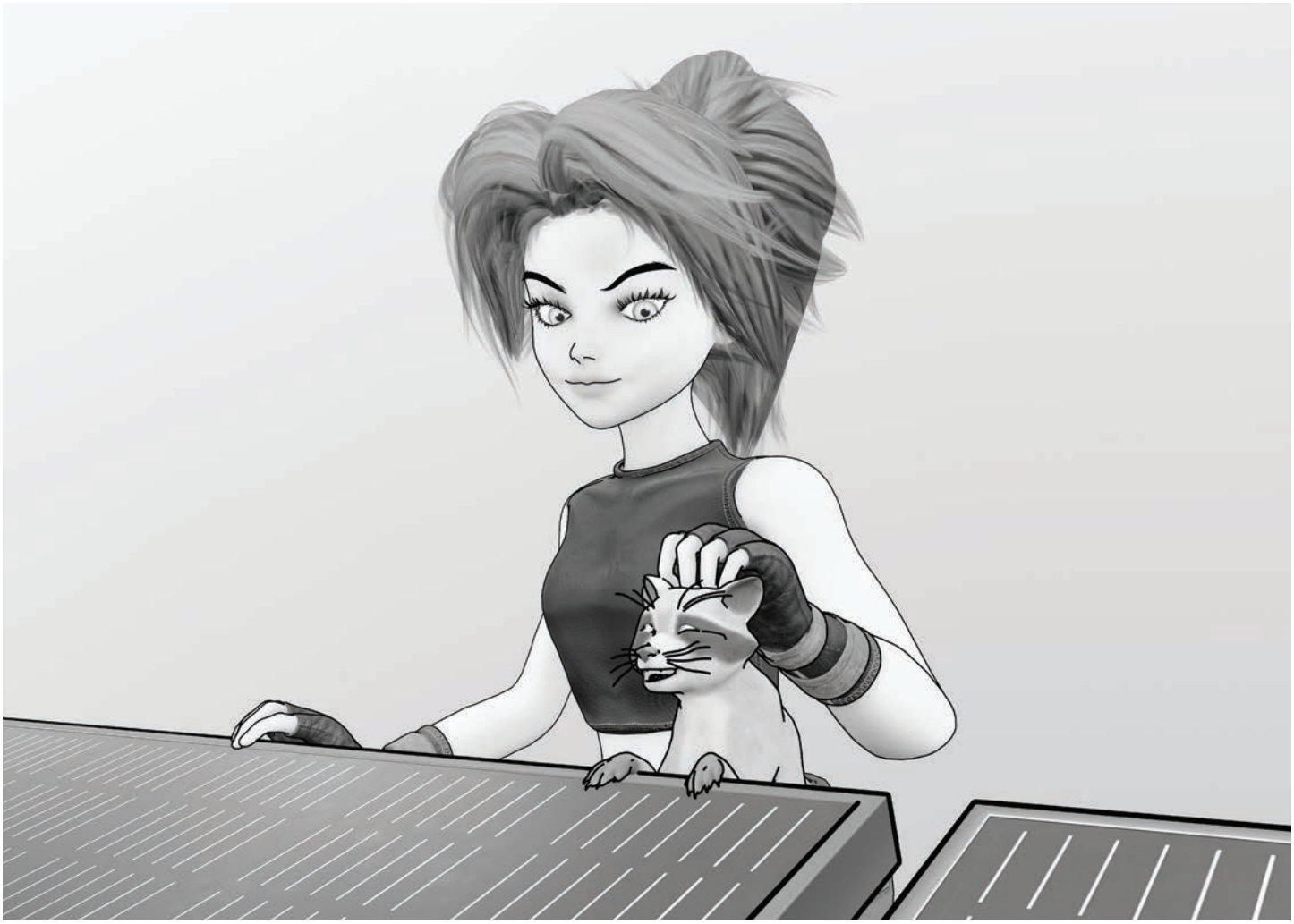
Breakdown of a Rooftop Solar System



Here, you see how the conduit carries electricity from the panels through the junction box, down to the combiner. From there, it enters the transfer switch. In this case, we're talking about a Franklin battery aGate. It manages the current between your panels, battery, panel, and the subpanel with your critical backup loads. It lets you "island" when the power goes out.

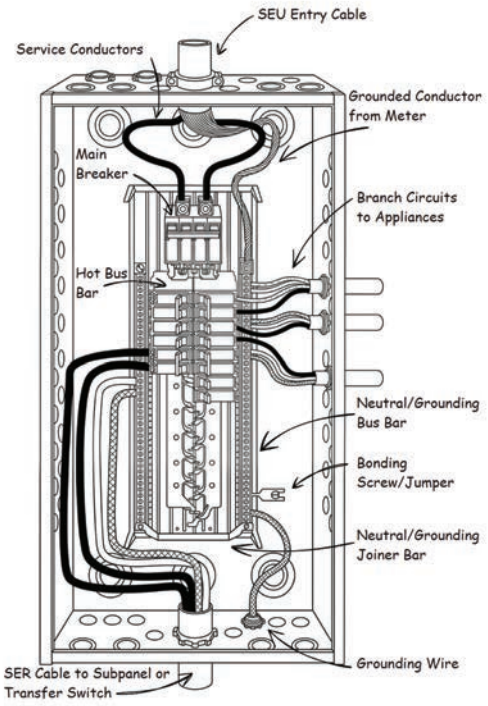


Breakdown of a Rooftop Solar System

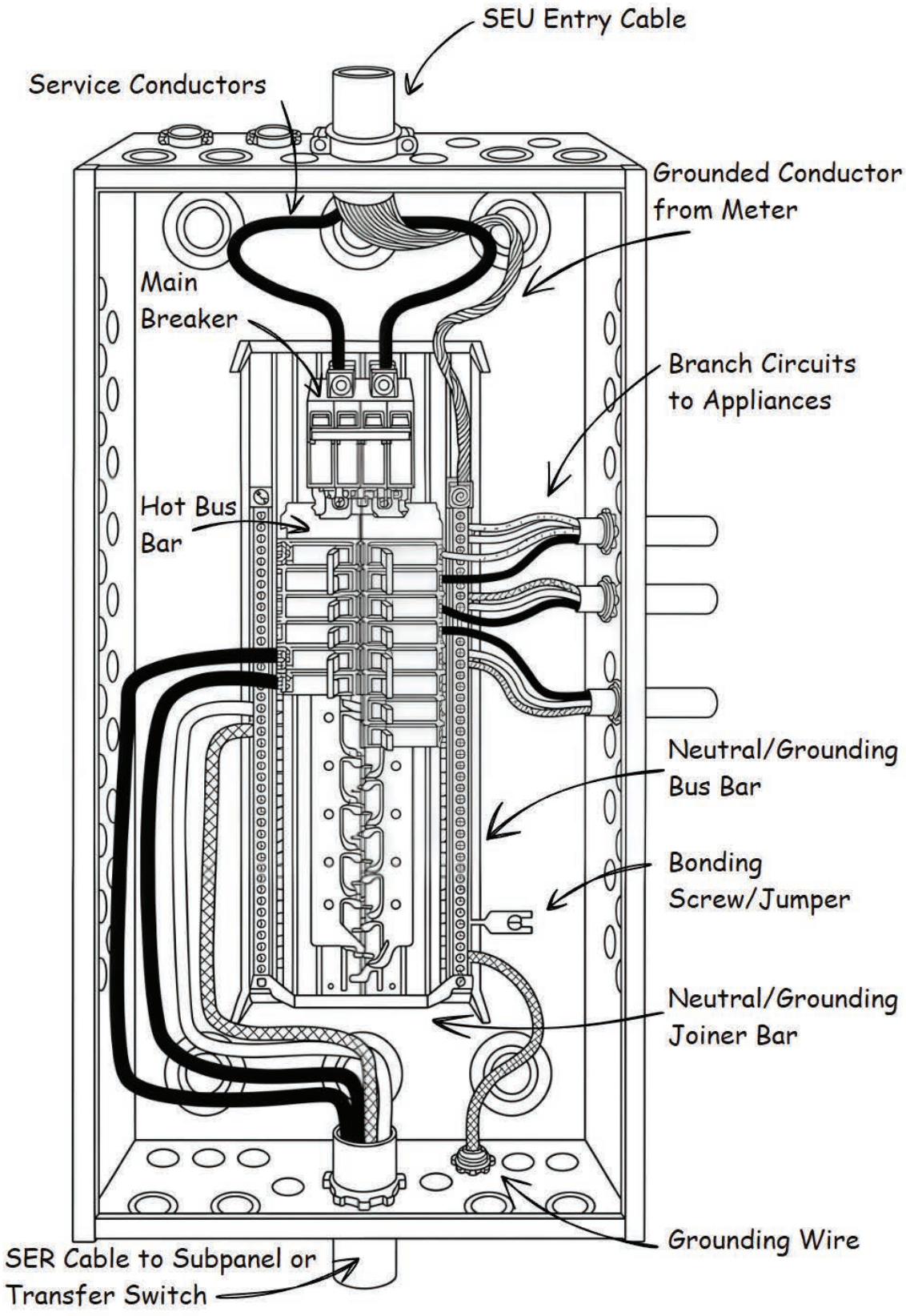


Only a certified electrician should ever open up your home panel board. It's still a good idea to know what goes on inside it. The more you know, the better you can communicate with qualified experts when something goes wrong.

Here, you see a generic home panel board. (There's a bigger version on the next page.) Your home's appliances and outlets all run to the panel board on branch circuits. Some run on 120V, but the heavier ones run on 240V. When electricians install a subpanel for critical backup loads, they disconnect the branch circuits from the breakers in your main panel and run them to the subpanel. The subpanel connects to the transfer switch. So does the battery, and the solar panels (through the combiner and emergency shutoff). The transfer switch is what keeps electricity from flowing back to the grid during a power outage.



Breakdown of a Rooftop Solar System



Solar Cheat Sheet

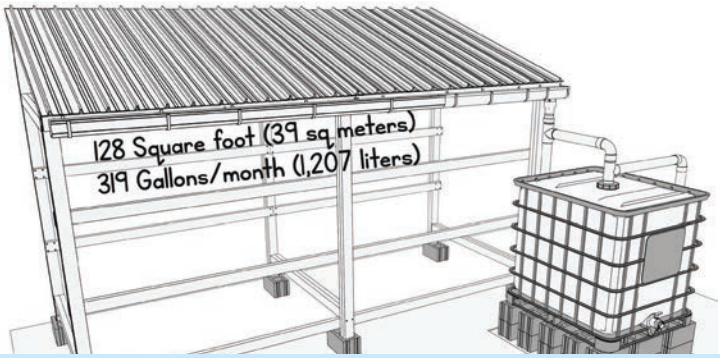
* Disasters and data center growth put many areas at a critical risk of outages and brownouts on a more regular basis over the coming decade.
* A typical American household uses 20–30 kWh a day.
* Not everyone can "get by" without electricity.
* DIY kits work well for small setups and off-grid living situations. They pose challenges if you want a larger system connected to the grid.
* A rooftop solar system on the grid will shut off during a power outage. You need a battery in order to "island" and have power during an emergency.
* A moderately-sized backup system costs $20–40,000.
* DIY kits can run as much as $20,000.
* Smaller systems cost less and still serve as good emergency backups.
* Professional installers will help you size your system and select the best, most compatible components, saving you time and stress. (It's also safer.)
* Lower electricity needs = smaller system. You can reduce your need for electricity by washing clothes and dishes by hand. You can also dry them by hand. Ditch hair driers and other high-energy appliances whenever possible. Use solar cookers to further reduce your needs. You can practice all this on a regular basis so it's easier to do during outages.
* You don't have to power your entire house. You can opt to power critical loads only, which means an even smaller, more affordable system.
* Before the install, make sure to test and label all the breakers on your home panel. Know what each breaker feeds. That helps you determine which appliances and outlets to consider critical. Make sure you communicate your critical loads to your installer. (They should ask for a sheet.)
* Batteries come in all sizes, but for larger systems they start around 5kWh and run up to 15–20 kWh. One smaller battery lets you run crucial loads.
* Avoid draining batteries below 50 percent, and especially discharging them down to zero. It will reduce life cycles, and it can damage the battery.
* If you need electricity to power crucial equipment, consider at least one larger battery (15–20kWh) that can last you through the night.
* Remember, solar panels generate less electricity on cloudy days.
* Avoid the door-to-door sales pitches. Most of them are offering solar leasing programs. You don't own the panels. You lease them, and then you pay the company for the power they generate.
* You start with a small system and expand it later, but doing so usually carries an additional installation cost.
* You can soft-expand your system with backup batteries from companies like Bluetti, Jackery, Renogy, Ecoflow, and Anker. During the day, you can charge backup batteries from AC outlets powered by your solar, as long as they're on your critical loads list.

How to Harvest Rain

This chapter explains the basics of rain harvesting. You'll learn how to calculate rainfall in gallons (liters). You'll also learn how to harvest rain for drinking and irrigation without having to redo your entire roof.

How much water do you need?

An average person needs a gallon of water a day for survival. That's 1/2 a gallon for drinking and 1/2 gallon for hygiene, or 30 gallons a month. If you're trying to grow food, you'll need thousands of gallons. Most vegetables need at least an inch of rain per week per acre. A 1/4 acre backyard homestead would need thousands of gallons of water a week to grow off the grid. During a bad drought, you could empty a 5,000-gallon cistern quickly.

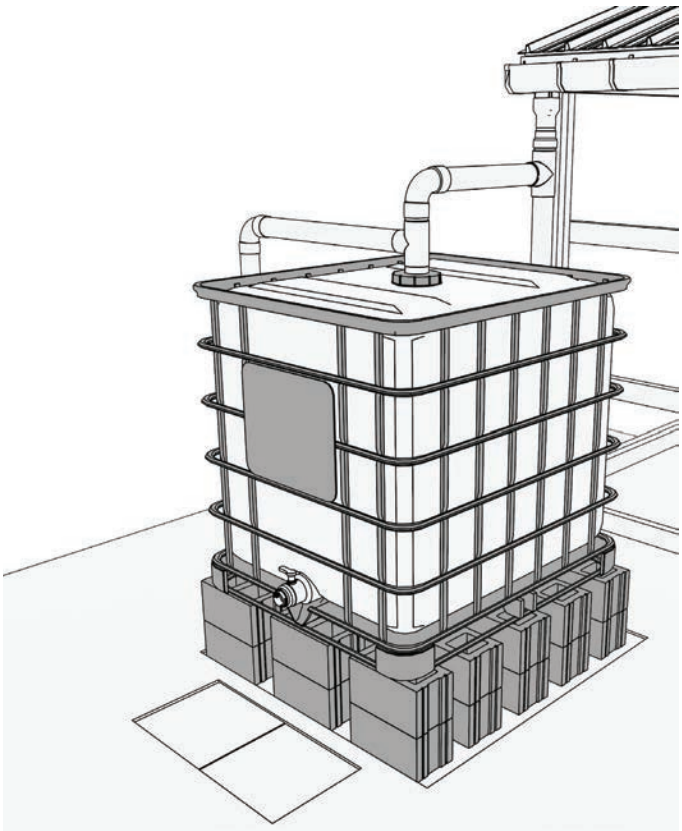


How much water can a roof catch?

Here's a simple formula:

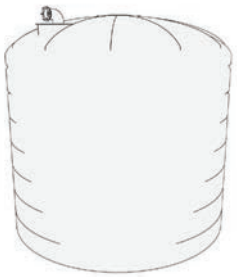
Area x inches (cm) of rain x .623 = amount collected

For example:
128 square foot (11.9m) x 4 inches (10 cm) x .623 = 319 gallons (1,207 liters)

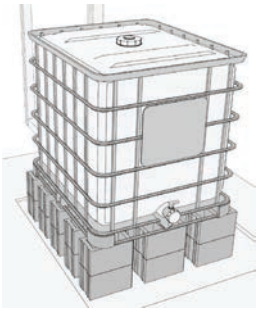


An average rain harvesting system measures about 1,000 square foot (92.9m) on one side of a roof. So it could collect about 2,500 gallons (9,464 liters) per month. That doesn't factor in spillage and evaporation, etc. A small rain harvesting system could supplement a backyard homestead and provide drinking water during an emergency.

What Do You Store Water in?



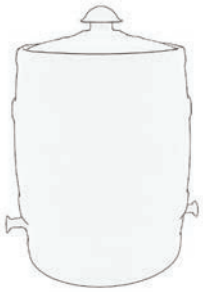
Large cisterns hold thousands of gallons, but they're expensive and hard to install. They usually require concrete slabs and special knowledge and skill to set up and maintain. The largest cisterns can hold 12,000 gallons (45K liters).



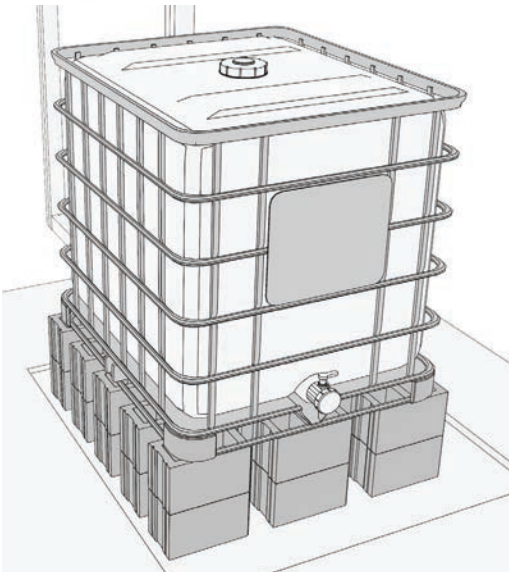
IBC Totes can hold 275 to 300 gallons (1,040 liters). They're easier to install and transport. You can find used ones online for affordable prices, and you can connect several together.



55-gallon drums (208 liters) hold small amounts of water, but they're the most affordable. Like IBC Totes, you can connect several together.



Rain barrels hold about as much as 55-gallon drums. They're pre-fitted with connections and easy to install, but they cost more. On the upside, they'll blend in better to a suburban back yard, and they're often more durable.



Why an IBC Tote Makes Sense

Used IBC totes offer the best return if you can set them up. They're the best option for someone looking to do serious homesteading in a small suburban space. Rain barrels or drums still work well, but you'd need 5 barrels or drums to hold as much rain water as one IBC tote. The tote's heavy duty plastic and steel cage make them much more durable.

What Type of Roof Works Best?



Metal roofs offer one of the best surfaces for rainwater collection. They're durable, and they can produce potable water for drinking and irrigation. Galvalume, aluminum, and pre-painted metal works best. Galvanized steel can leach zinc, so it requires monitoring.



Slate roofing also works well for collecting rainwater. It's safe for drinking and irrigation, but it's also heavier.



Clay tile roofs also work extremely well as a collection surface for the same reasons. The only downside is they can produce water with a higher pH, which could affect your plants.



Asphalt shingles aren't the best collection surface, especially new roofs. They can leach harmful chemicals into the water.

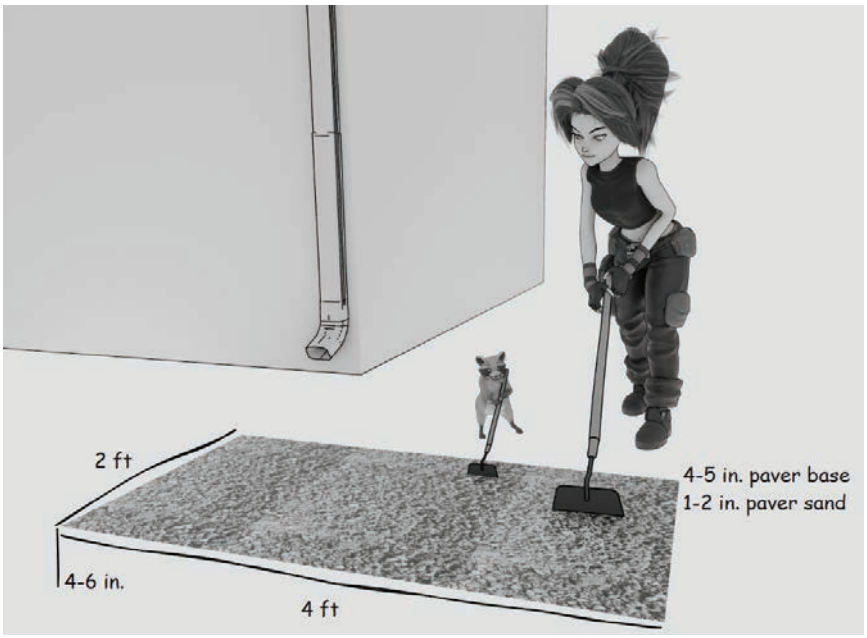
Most people can't redo their roof just for the sake of installing a rain harvesting system, but you can still harvest rain. You just have to think a little outside the box. You can retrofit sheds or add a rain collecting surface in ways that don't cost a ton of money. You can just build surfaces to collect rain.

Considerations & Limitations

Rain catchment systems can offer practical advantages, and they bring a sense of security and peace of mind. But they're not a total failsafe. They run up against some limitations, and they're just one part of a larger water security plan.

* If your rain harvesting system lies aboveground, you'll have to winterize it. That means emptying the tank before first frost, capping the outlet, and storing the valve inside. You can install tanks and systems below ground, but it costs more. You'll probably need to hire a crew, and you might need additional permits.
* Rain harvesting systems can fail. Parts can break. Even if you can repair them quickly, you should still store emergency water indoors.
* It's definitely possible to connect a rain harvesting system to your indoor plumbing. You can feed it with solar pumps. Doing that takes more time and money. You might have to hire professionals, and you'll definitely need approval from your city or county.
* If you're connecting your system to indoor plumbing, you'll need a multi-stage filtration system. It comes with additional upkeep costs. If you plan on using it for longterm emergencies, make sure you stock up on filters and parts. Know how the system works in detail, so you can repair and troubleshoot it as needed.
* Understand your water usage. It goes faster than you think.
* You can technically use your rainwater for whatever you want. Nobody is going to spy on you in your back yard, but you'll definitely need to filter your water, either with a full system or at least with a gravity-fed system.
* Even large tanks can run empty if you're using them on a regular basis for drinking, plumbing and gardening.
* Rain catchment systems will ultimately fail during a prolonged drought. Make sure you have additional ways of obtaining water. It's a good idea to keep 30-50 gallons of stored water at minimum. It's also a good idea to have a dew catcher, a water generator if you can afford it (or even just a dehumidifier), and even a well.

Rain Harvesting with Barrels

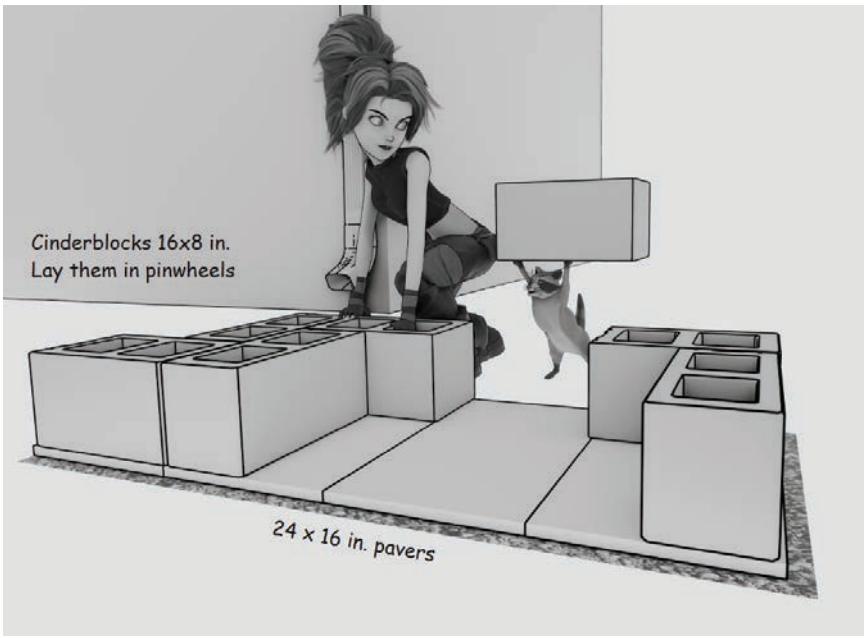


Rain barrels make a lot of sense if you want a discrete, low profile catchment system that you can expand over time without having to deal with a bulky IBC tote.

Harvesting rain poses some challenges for anyone who lives in American suburbs under a shingle roof, but you have options when it comes to filtration for emergency drinking.

The first thing you'll need to do is dig out a base and lay a foundation. Fill it with paver base.

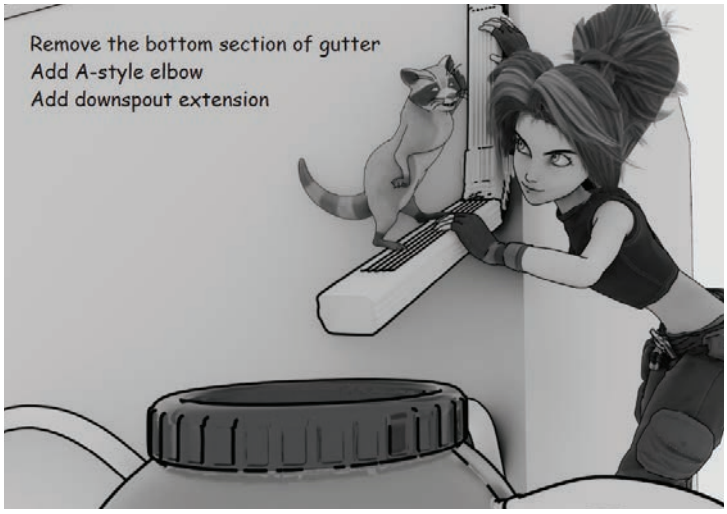
Laying Down Your Foundation

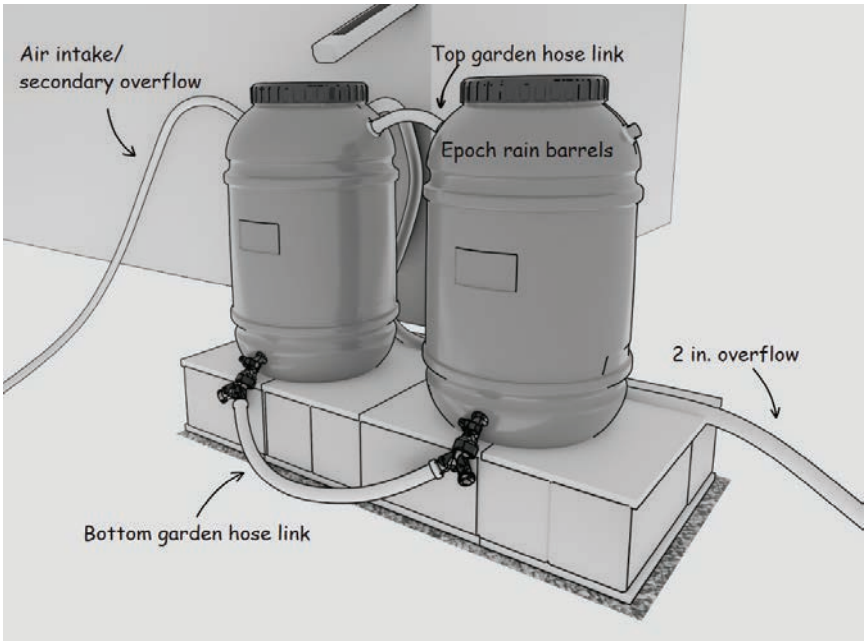


Once you've laid down your paver base, you need to make a sturdy foundation. Rain barrels hold hundreds of pounds of water when they're full. You'll want to lay down heavy paving stones as a first layer. Then lay down cinderblocks in a pinwheel arrangement shown here. Then lay down another layer of pavers.

This foundation provides enough elevation for hoses and buckets. It's strong enough to deal with the fluctuating weight of the barrels as they fill and empty.

Build your foundation and position your barrels 1-2 feet away from your structure. Then configure your gutters. Avoid diverter kits. They won't deliver enough water during brief downpours. Remove the bottom section of gutter. You'll probably have to unscrew the downspout straps. You might be able to simply reconfigure your gutter pieces like the image shown here. Make sure to leave several inches of space between the gutter and the top of your barrel. You can cut gutters with a hacksaw. You can also buy custom-cut gutter lengths from places like Gutterworks.

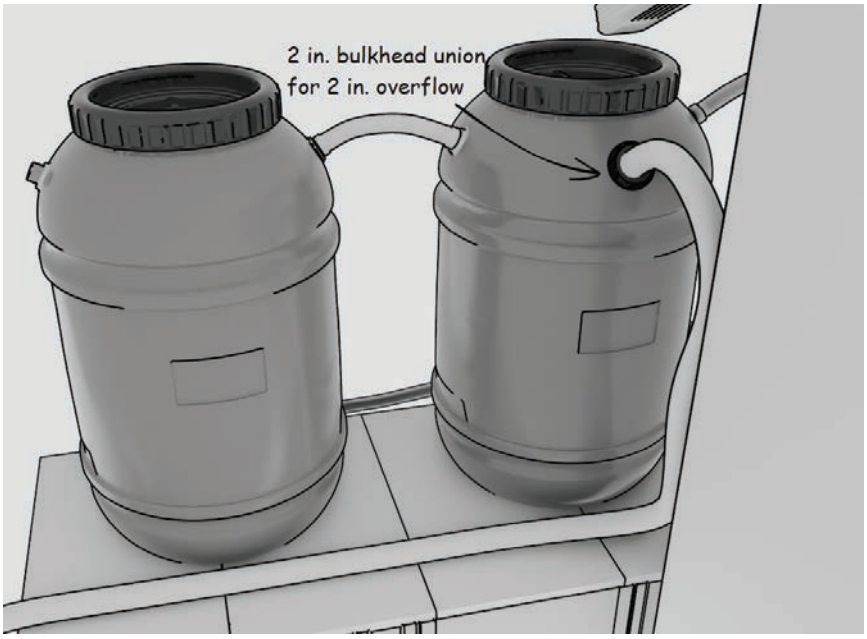




This is how your setup will look with everything installed. It's not as complicated as it looks.

You can get barrels with preinstalled faucets and hose outlets from companies like Epoch. They sell upcycled food barrels that used to hold pickles and olives. These are some of the most durable barrels available. They'll last 10+ years. You'll also want bigger hoses for your overflows if you're not using a diverter kit, as well as hose splitters. We'll talk about the rest of the parts over the next few pages.

The Setup Explained



You'll want a more serious hose to handle a gutter's full overflow during storms. A flash flood can deliver 3-4 inches per hour or more. A 2 inch hose can handle it. You can find them at online suppliers like Gloxco.

A 2-inch hose from Gloxco will fit into a 2 inch bulkhead union.

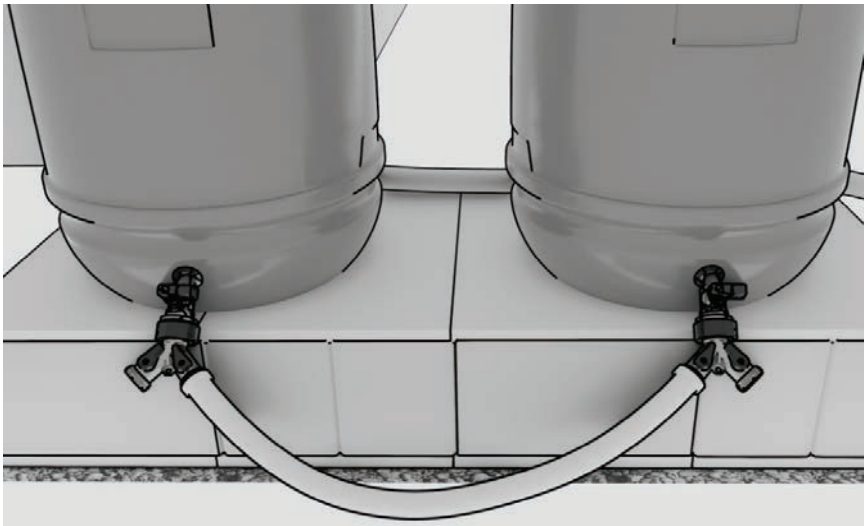
You'll have to install the bulkhead union yourself, by drilling a 3 inch hole in your first barrel.

Yes, a 3-inch hole.

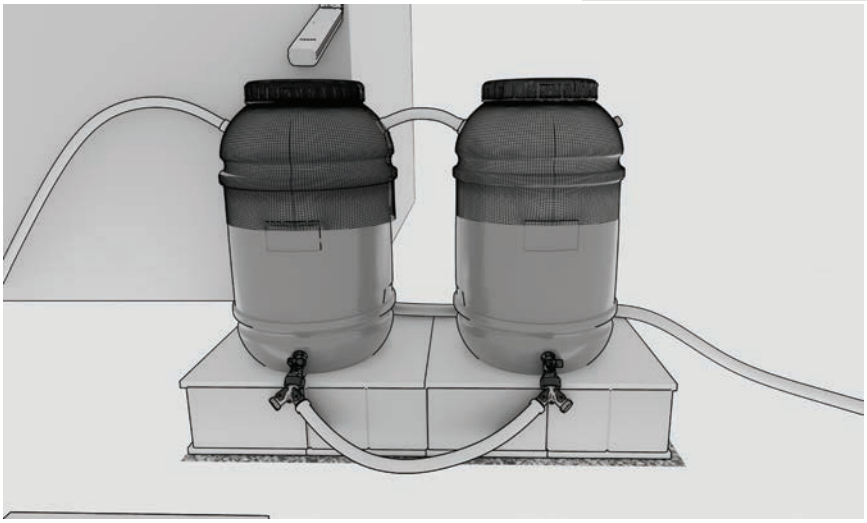
Add hose splitters to each barrel. You'll want to do this for a few different reasons. First, it allows you to link your barrels at the top as well as the bottom. The bottom link allows the water to level between the two barrels. They'll fill and empty at the same rate now.

Hose splitters also allow you to draw water from either barrel. You can also connect hoses or pumps to either spigot.

This makes your life easier.



Hose splitter for each barrel

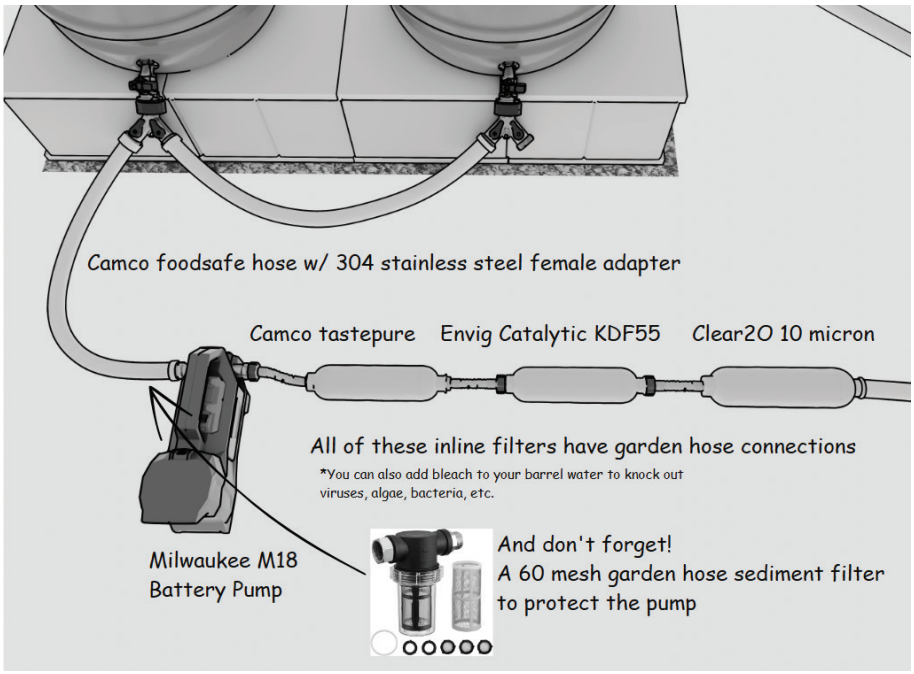


Many rain barrels come with screened holes, but you might want an extra layer of protection.

You can buy barrel nets that fit over the entire top part of the barrel. They're easy to put on.

All the debris from the first gutter gush ends up on the net. You just pull it off and shake it.

Using Inline Filters



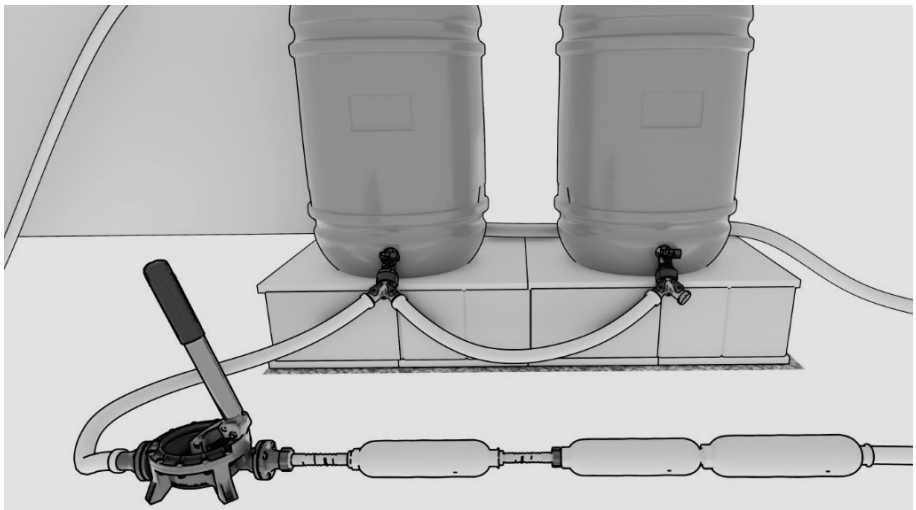
It's essential to filter your rainwater if you're living in North America. Most American homes have shingle roofs. It's not safe to drink that water. In many places, it's not even legal.

During an extreme emergency, you might have no choice but to drink some of your rainwater. In that case, you can filter out the vast majority of the heavy metals and VOCs associated with asphalt shingles. It's not quite as hard as it might sound.

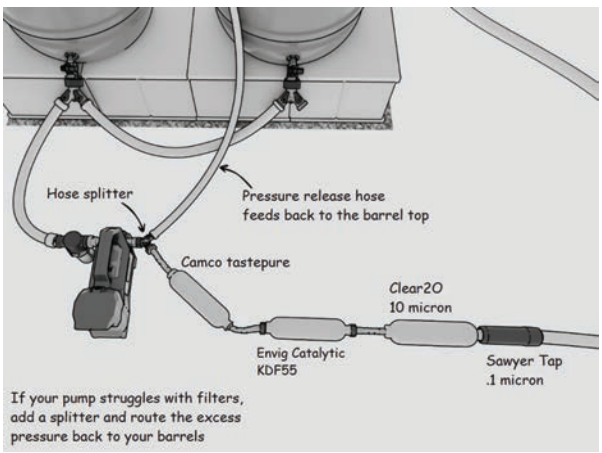
There's a few ways to do it.

Option A: Inline RV filters.

These inline filters come with native garden hose thread. You connect them to a portable pump like the Milwaukee M18. It has the power to handle these kinds of filters. You'll want a garden hose sediment filter for the pump intake to protect the motor. On the outlet, you'll want a 10-20 micron sediment filter, a carbon block filter to scrub VOCs and metals, and then a fine sediment filter 1-10 microns for cleanup. From there, you pour the water into a gravity-fed system.



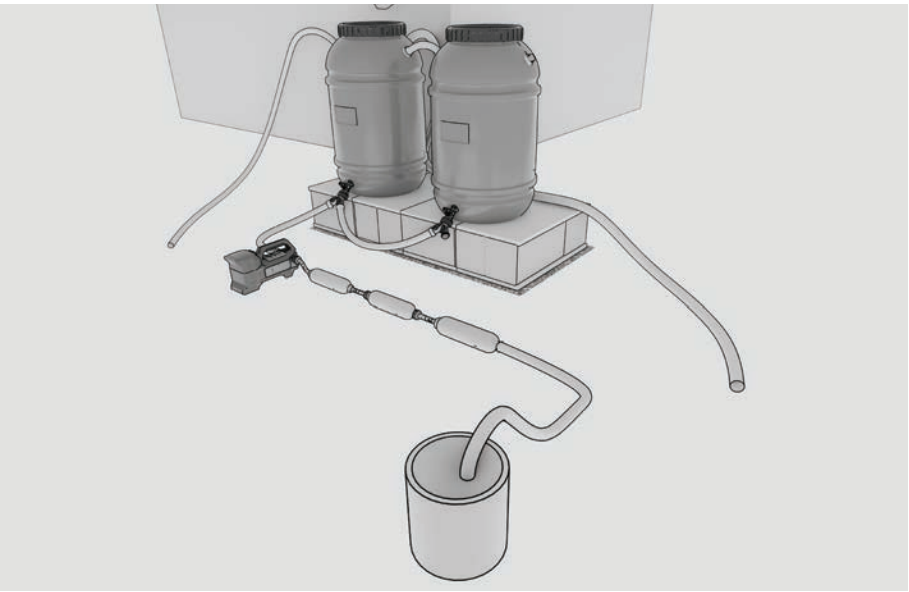
Same setup, but with a heavy duty manual, industrial pump and extended handle: Bosworth Guzzler GH-0400N-5 or GH-0400N (shorter handle, way cheaper) Made for use with drinking water



You might want a non-electric backup pump. If so, Bosworth sells a few different models of industrial pumps that deliver enough pressure to handle these filters. They're made with foodsafe materials. The basic models are affordable. Some are... more expensive.

If you want tighter filtration, companies like Clear2O make 1-micron inline filters with garden hose threading. Sawyer makes a .1 micron filter that also accepts native garden hose thread.

The Final Stages

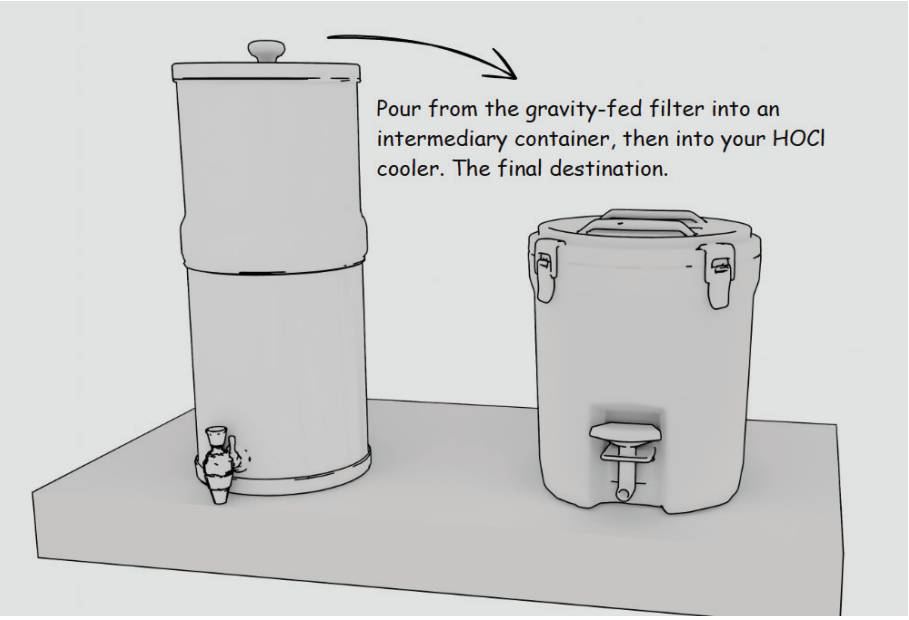


You're running the pump into a collection container of some kind. A foodsafe bucket works best. You'll also want to use foodsafe hoses from a company like Camco, especially from your last filter to the bucket.

From here, you'll take your water to the final stages of filtration. It sounds like a lot of steps, but this replicates the kind of filtration water undergoes at treatment plants. It's worth the effort.

Use a gravity-fed system with a carbon block filter for the final stage. This last stage removes any final traces of VOCs and heavy metals. Research and testing revealed Alexapure filters to offer the most reliable filtration. They last up to 200 gallons when filtering VOCs and metals, but using the inline filters as a shield can prolong their life considerably. Just removing trace contaminants, they might last closer to their full 2-3,000 gallon lifespan as advertised for general purposes.

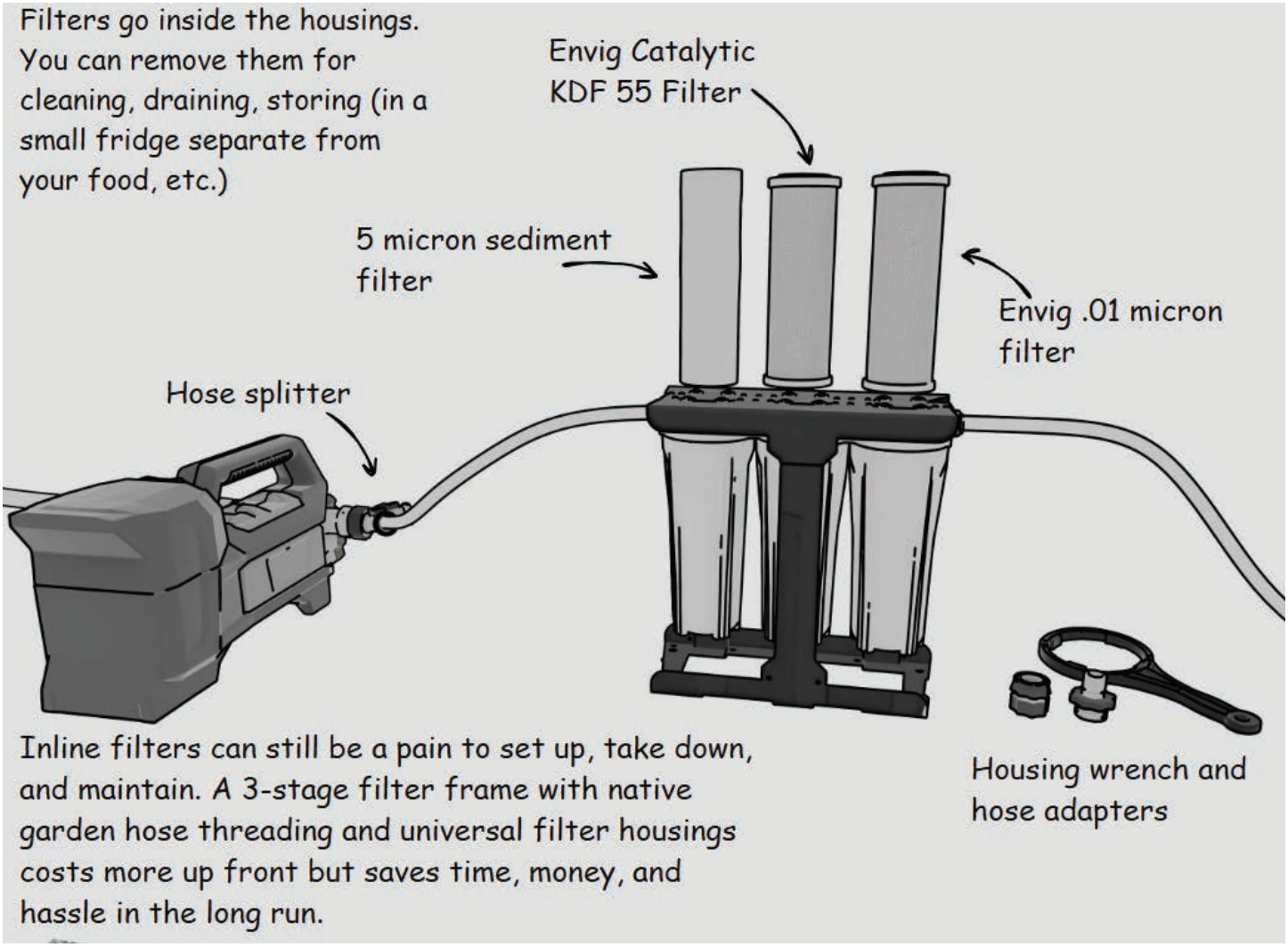




Bacteria will grow in any water that's not chlorinated. To maximize safety, you'll want to rechlorinate your water before drinking it. HOCl (discussed next page) will ruin carbon block filters and corrode metal over time, so it's best to add it to a completely separate container.

This filtration setup produces water that's as safe as possible to drink during emergencies or long-term grid outages. See the lab results in a few pages.

A Streamlined Setup



It can get tedious to constantly set up and take down inline filters if you plan on filtering rainwater for extended periods. There's good news: You can use 3-stage RV filtration rigs to simplify and streamline the process.

When you switch to 3-stage filtration setups, you're using universal 2.5x10 inch filter canisters. These canisters let you drop in any replacement filter from any brand. It gives you more options, including more powerful sediment and carbon filters.

For this setup: You can use a 5-10 micron sediment filter for stage 1. Use a heavy carbon block for stage 2. Catalytic KDF 55 carbon filters offer robust filtration for VOCs and heavy metals. For stage 3, you can go all the way down to a .01 micron filter. This eliminates virtually all microbes and many viruses.

Even with .01 micron filtration, you'll still want to add a final layer of filtration for viruses. You can boil the water or use a chlorine-based option like bleach or HOCl.

What is HOCl? How much?



Hypochlorous Acid (HOCl) belongs to the chlorine family. It's a powerful disinfectant 80 times more powerful than bleach when it comes to killing pathogens. It offers major advantages when it comes to treating your rainwater. First, it's safer for humans and animals. Your own body produces HOCl to fight germs. Second, you can generate your own with a HOCl generator like the Eco One. You just follow the directions, adding salt and vinegar then running the generator for 1-2 cycles.

Add 1/3 a cup of HOCl at 200 ppm to every gallon of water you want to purify. That's 2/3 cup for a 2-gallon cooler. This keeps your final mix to 3-4 ppm, under federal guidelines. You can also add it to your rain barrels to control for pathogens in real-time.

Lab Results

Rigorous lab tests from Tap Score show that these combined filtration methods remove the vast majority of contaminants, including bacteria. Here, you'll see a detailed breakdown.

Parameter	Result	Evaluation: Federal MCLG	Method, MDL and RL
E. coli Bacteria	**Not Detected**	No evaluation possible	**SM 9223B** RL 1 P/A
Total Coliform Bacteria	**Not Detected**	No evaluation possible	**SM 9223B** RL 1 P/A
Bromochloromethane Disinfection Byproducts	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.292 PPB RL 0.5 PPB
Bromodichloromethane Disinfection Byproducts	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.184 PPB RL 0.5 PPB
Bromoform Disinfection Byproducts	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.203 PPB RL 0.5 PPB
Chloroform Disinfection Byproducts	**0.54** PPB	Federal MCLG: 70 PPB	**EPA 524.2** MDL 0.372 PPB RL 0.5 PPB
Dibromochloromethane Disinfection Byproducts	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.175 PPB RL 0.5 PPB
Dibromomethane Disinfection Byproducts	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.197 PPB RL 0.5 PPB
Total THMs Disinfection Byproducts	**0.54 (Total)** PPB	No evaluation possible	**Calculation**
Boron Inorganics	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.0131 PPM RL 0.03 PPM

Chloride Inorganics	**83.2** PPM	No evaluation possible	**EPA 300.0** MDL 1.18 PPM	RL 2.5 PPM
Fluoride Inorganics	**Not Detected ***	No evaluation possible	**EPA 300.0** MDL 0.0403 PPM	RL 0.5 PPM
Nitrate (as N) Inorganics	**0.2** PPM	Federal MCLG: 10 PPM	**EPA 300.0** MDL 0.015 PPM	RL 0.125 PPM
Nitrite (as N) Inorganics	**Not Detected ***	No evaluation possible	**EPA 300.0** MDL 0.05 PPM	RL 0.125 PPM
Phosphorus Inorganics	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.0294 PPM	RL 0.2 PPM
Silica Inorganics	**8.53** PPM	No evaluation possible	**EPA 200.7** MDL 0.0667 PPM	RL 0.214 PPM
Sulfate Inorganics	**Not Detected ***	No evaluation possible	**EPA 300.0** MDL 1.62 PPM	RL 2.5 PPM
Aluminum Metals	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.101 PPM	RL 0.2 PPM
Antimony Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000184 PPM	RL 0.0004 PPM
Arsenic Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000154 PPM	RL 0.001 PPM
Barium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000096 PPM	RL 0.0004 PPM
Beryllium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000115 PPM	RL 0.0004 PPM
Cadmium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000104 PPM	RL 0.0004 PPM
Chromium (Total) Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.00043 PPM	RL 0.002 PPM
Cobalt Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000073 PPM	RL 0.0004 PPM
Copper Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000763 PPM	RL 0.005 PPM
Iron Metals	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.072 PPM	RL 0.2 PPM
Lead Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000121 PPM	RL 0.0004 PPM
Lithium Metals	**0.00547** PPM	No evaluation possible	**EPA 200.7** MDL 0.0001 PPM	RL 0.001 PPM
Manganese Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.00025 PPM	RL 0.0004 PPM
Mercury Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000138 PPM	RL 0.0008 PPM
Molybdenum Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000062 PPM	RL 0.0004 PPM

Nickel Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000999 PPM	RL 0.005 PPM
Selenium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000181 PPM	RL 0.001 PPM
Silver Metals	**0.0331** PPM	No evaluation possible	**EPA 200.8** MDL 0.000306 PPM	RL 0.0004 PPM
Strontium Metals	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.00505 PPM	RL 0.05 PPM
Thallium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.0000965 PPM	RL 0.0004 PPM
Tin Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000121 PPM	RL 0.0004 PPM
Titanium Metals	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.000824 PPM	RL 0.002 PPM
Uranium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.0000241 PPM	RL 0.0004 PPM
Vanadium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000353 PPM	RL 0.002 PPM
Zinc Metals	**Not Detected ***	No evaluation possible	**EPA 200.7** MDL 0.00428 PPM	RL 0.01 PPM
Bicarbonate ⌄ Minerals	**61.1** PPM	No evaluation possible	**Calculation**	
Calcium Minerals	**13.6** PPM	No evaluation possible	**EPA 200.7** MDL 0.085 PPM	RL 0.2 PPM
Carbonate ⌄ Minerals	**0.0707** PPM	No evaluation possible	**Calculation**	
Magnesium Minerals	**3.27** PPM	No evaluation possible	**EPA 200.7** MDL 0.0408 PPM	RL 0.2 PPM
Potassium Minerals	**1.82** PPM	No evaluation possible	**EPA 200.7** MDL 0.192 PPM	RL 0.2 PPM
Sodium Minerals	**53.7** PPM	No evaluation possible	**EPA 200.7** MDL 0.134 PPM	RL 0.2 PPM
cis 1,3 Dichloropropene Pesticides	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.179 PPB	RL 0.5 PPB
trans 1,3 Dichloropropene Pesticides	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.23 PPB	RL 0.5 PPB
Benzene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.211 PPB	RL 0.5 PPB
Ethylbenzene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.349 PPB	RL 0.5 PPB
m,p Xylene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.857 PPB	RL 1 PPB
Methyl Tertiary Butyl Ether Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.215 PPB	RL 0.5 PPB

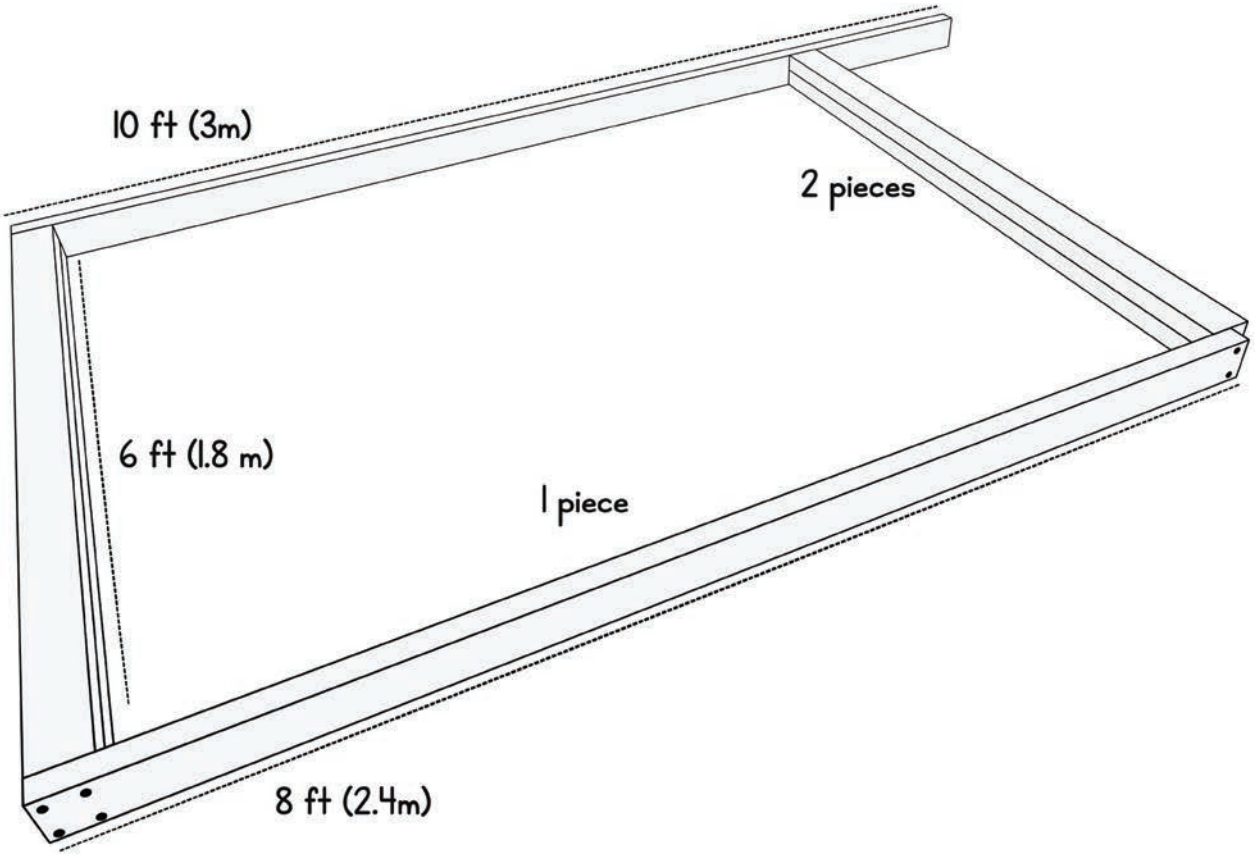
Naphthalene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.398 PPB	RL 0.5 PPB
o Xylene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.346 PPB	RL 0.5 PPB
Toluene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.244 PPB	RL 0.5 PPB
Alkalinity (as CaCO3) Properties	**50.2** PPM	No evaluation possible	**SM 2320 B** RL 20 PPM	
Chloride-to-Sulfate Mass Ratio Properties	**N/A**	No evaluation possible	**Calculation**	
Expanded Hardness Properties	**47.4** PPM	No evaluation possible	**Calculation**	
Grains per gallon Properties	**2.77** Grains	No evaluation possible	**Calculation**	
Hardness Properties	**47.3** PPM	No evaluation possible	**SM 2340 B** MDL 0.38 PPM	RL 1.32 PPM
Langelier Saturation Index Properties	**-1.37**	No evaluation possible	**Calculation**	
pH Properties	**7.4**	No evaluation possible	**SM 4500-H+B** RL 0.01 pH	
Sodium Adsorption Ratio Properties	**3.39**	No evaluation possible	**Calculation**	
Specific Conductivity Properties	**230** umhos/cm	No evaluation possible	**SM 2510 B** RL 2 umhos/cm	
Total Dissolved Solids Properties	**135** PPM	No evaluation possible	**SM 2510 B** MDL 1.92 PPM	RL 1.92 PPM
Turbidity Properties	**1.1** NTU	No evaluation possible	**EPA 180.1** MDL 0.22 NTU	RL 0.5 NTU
1,1 Dichloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.325 PPB	RL 0.5 PPB
1,1 Dichloroethylene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.238 PPB	RL 0.5 PPB
1,1 Dichloropropene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.179 PPB	RL 0.5 PPB
1,1,1 Trichloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.146 PPB	RL 0.5 PPB
1,1,1,2 Tetrachloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.185 PPB	RL 0.5 PPB
1,1,2 Trichloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.179 PPB	RL 0.5 PPB
1,1,2,2 Tetrachloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.208 PPB	RL 0.5 PPB
1,2 Dichlorobenzene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.252 PPB	RL 0.5 PPB

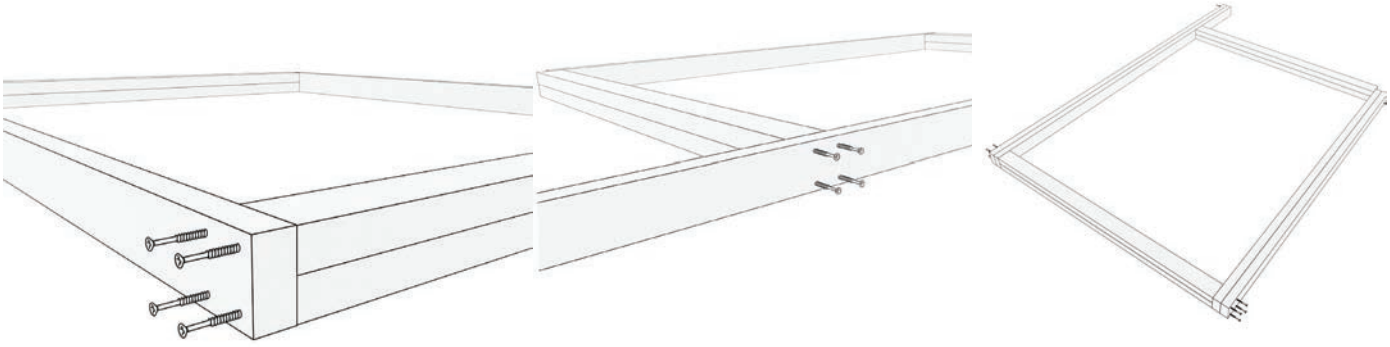
1,2 Dichloroethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.192 PPB	RL 0.5 PPB
1,2 Dichloropropane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.2 PPB	RL 0.5 PPB
1,2,3 Trichlorobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.325 PPB	RL 0.5 PPB
1,2,3 Trichloropropane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.223 PPB	RL 0.5 PPB
1,2,4 Trichlorobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.239 PPB	RL 0.5 PPB
1,2,4 Trimethylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.44 PPB	RL 0.5 PPB
1,3 Dichlorobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.268 PPB	RL 0.5 PPB
1,3 Dichloropropane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.176 PPB	RL 0.5 PPB
1,3,5 Trimethylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.471 PPB	RL 0.5 PPB
1,4 Dichlorobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.309 PPB	RL 0.5 PPB
2,2 Dichloropropane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.473 PPB	RL 0.5 PPB
Bromobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.239 PPB	RL 0.5 PPB
Bromomethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.316 PPB	RL 0.5 PPB
Carbon Tetrachloride VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.198 PPB	RL 0.5 PPB
Chlorobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.211 PPB	RL 0.5 PPB
Chloroethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.236 PPB	RL 0.5 PPB
Chloromethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.181 PPB	RL 0.5 PPB
Chlorotoluene 2 VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.198 PPB	RL 0.5 PPB
Chlorotoluene 4 VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.306 PPB	RL 0.5 PPB
cis 1,2 Dichloroethylene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.33 PPB	RL 0.5 PPB
Dibromochloropropane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.18 PPB	RL 1 PPB
Dichlorodifluoromethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.417 PPB	RL 0.5 PPB

Dichloromethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.252 PPB	RL 0.5 PPB
Ethylene dibromide VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.33 PPB	RL 1 PPB
Hexachlorobutadiene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.466 PPB	RL 0.5 PPB
Isopropylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.269 PPB	RL 0.5 PPB
n Butylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.435 PPB	RL 0.5 PPB
n Propylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.442 PPB	RL 0.5 PPB
p Isopropyltoluene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.267 PPB	RL 0.5 PPB
sec Butylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.498 PPB	RL 0.5 PPB
Styrene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.409 PPB	RL 0.5 PPB
tert Butylbenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.406 PPB	RL 0.5 PPB
Tetrachloroethylene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.205 PPB	RL 0.5 PPB
Trichloroethylene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.204 PPB	RL 0.5 PPB
Trichlorofluoromethane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.496 PPB	RL 0.5 PPB
Vinyl Chloride VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.117 PPB	RL 0.5 PPB

Building Out Your Frame

You might decide you want to build an entirely separate structure for rain harvesting and install a bigger IBC tote. That's fine. If so, these instructions explain a simple approach. You're going to make three big frame pieces like this one. Make these flat on the ground. Screw (or nail) one 2x4x10 ft beam to four 2x4x6 ft beams. The long side measures 10 ft long. (If you're already planning to use a shed, you can skip the next few pages.)

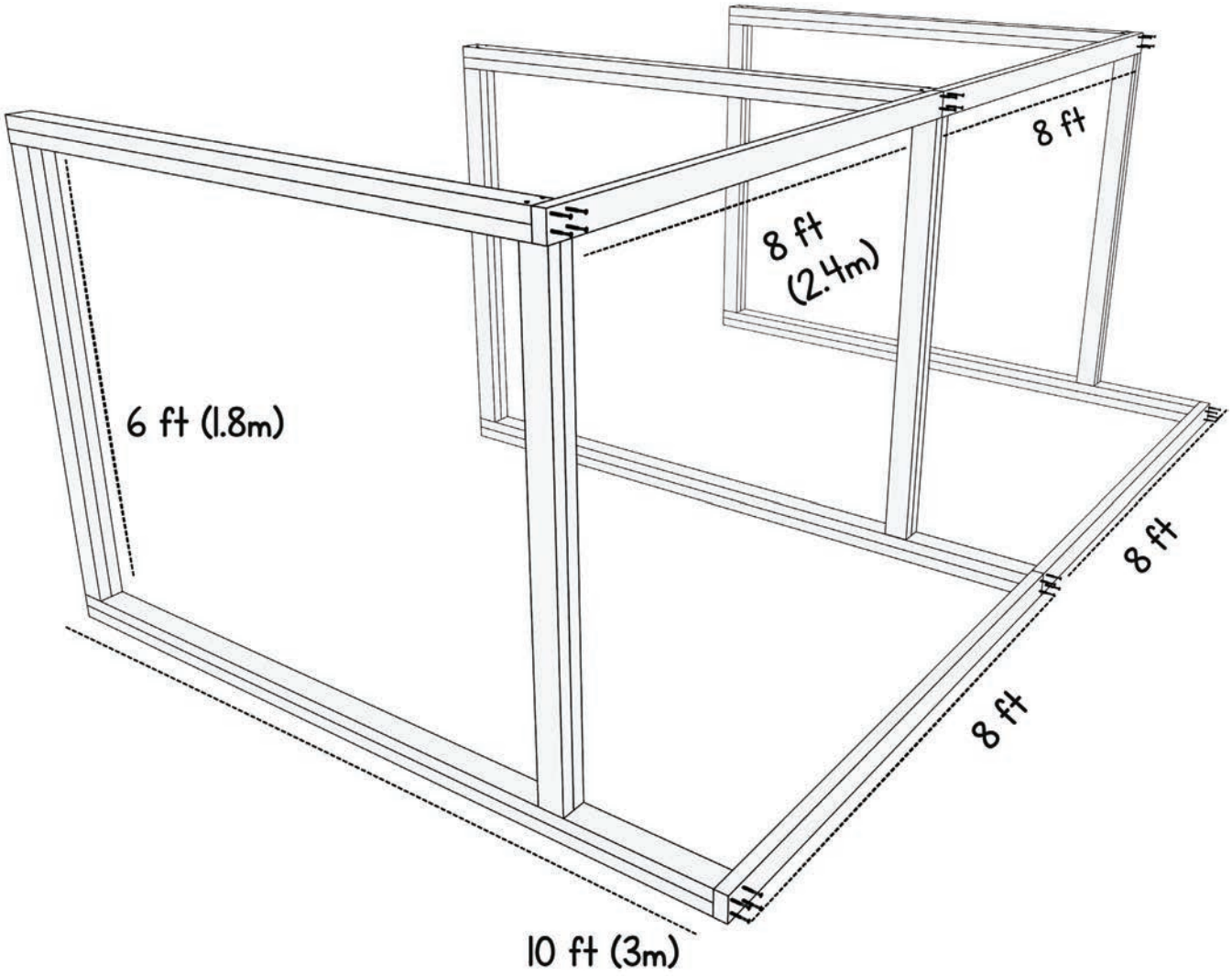


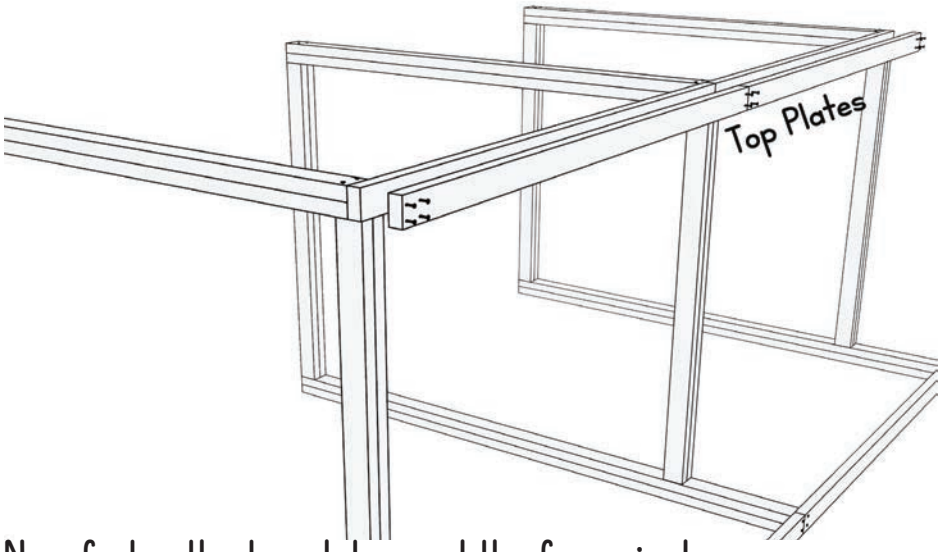


Add another 8 ft (2.4m) and another 10 ft (3m) piece to the front and back.

Finishing The Frame

Now you're going to connect the three big frames with 8 ft beams. You can put them on their sides to make the job easier.

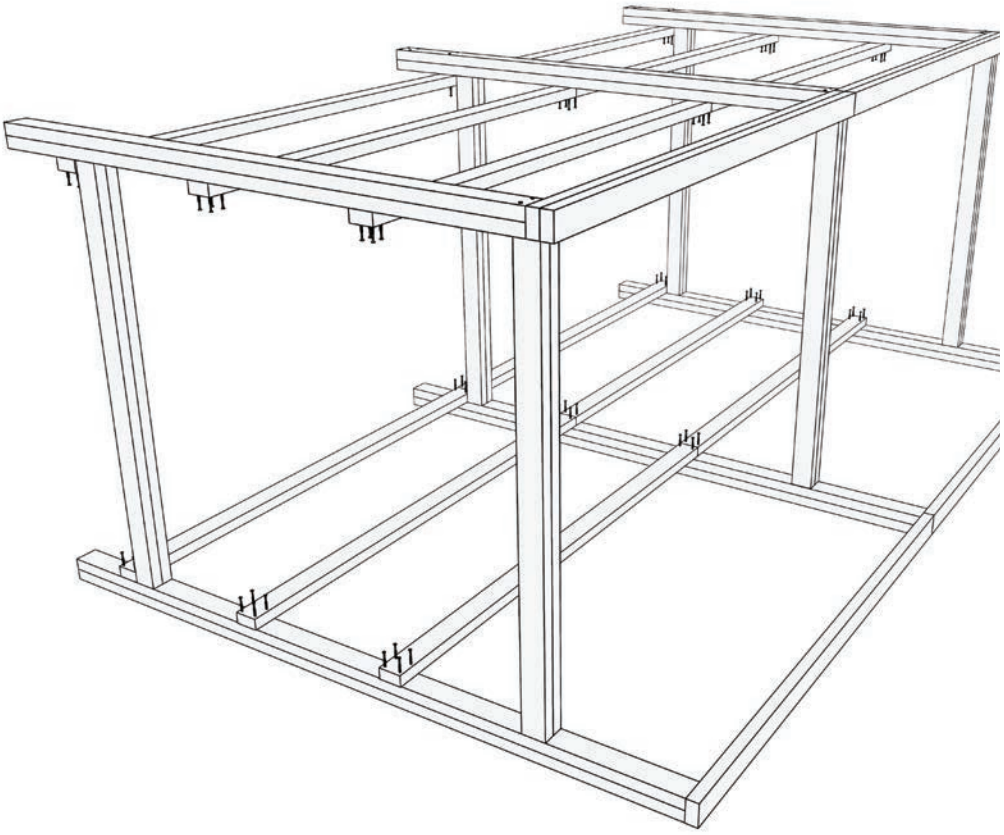




Now fasten the top plates, and the frame is done.

Adding Lateral Support

Finally, add 8 more 8 ft (2.4m) beams to give the frame some lateral support. This step especially matters in windy areas.





You can set the frame in cinder blocks to help guard it against high winds. Add quikrete or cement to give the base even more hold.

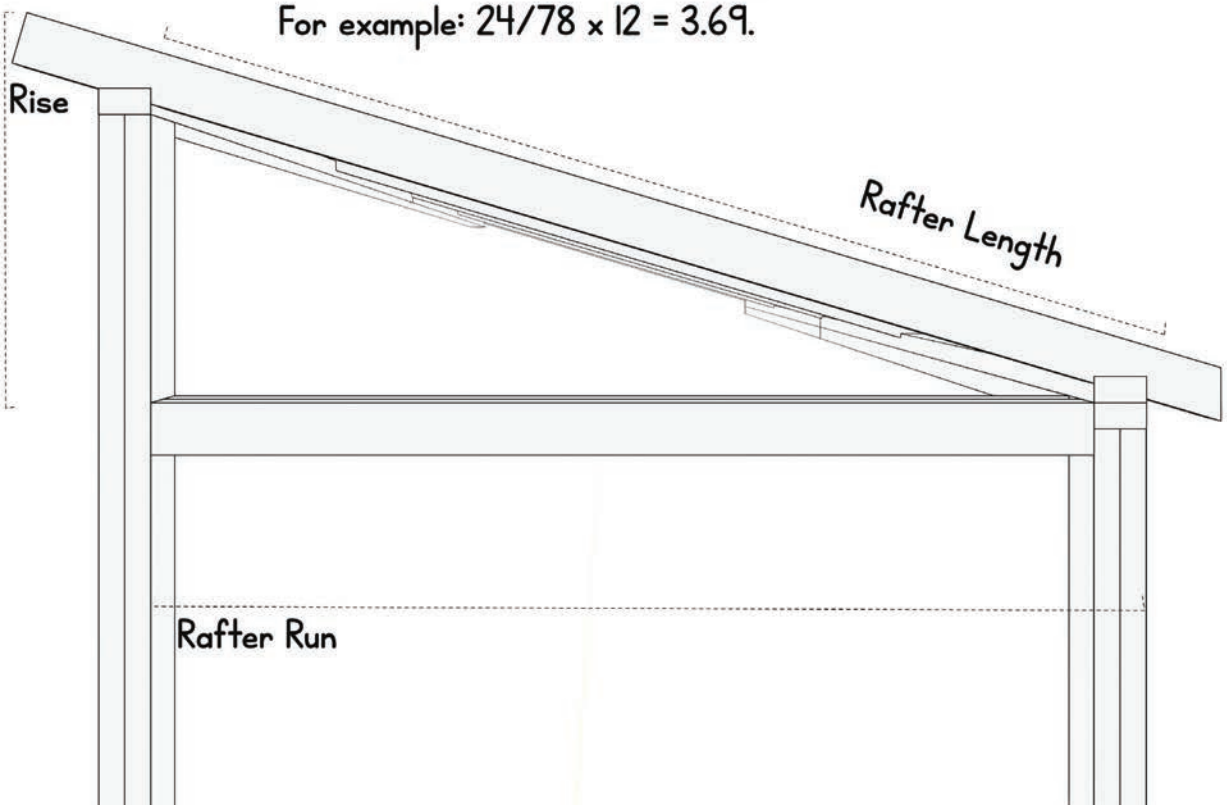
This might not look pretty, but it's easier than leveling ground and screwing post bases into concrete. (You can still do that.)

Cutting The Rafter Seats

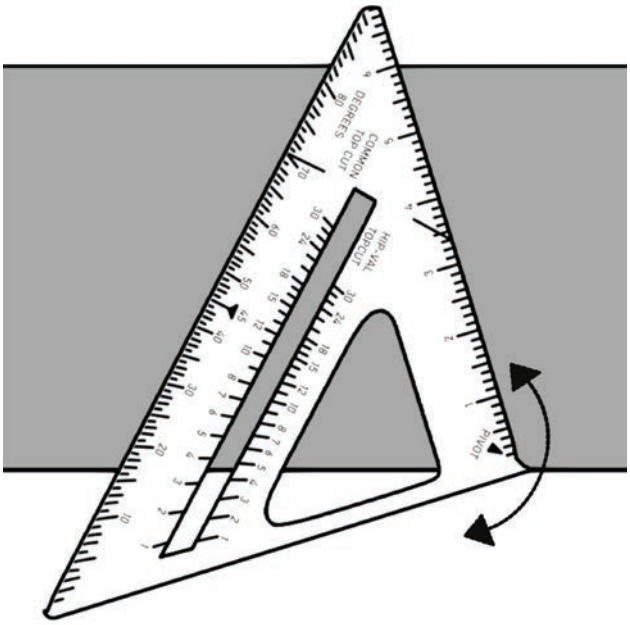
Once you've got the frame, you'll need to measure the birdsmouth cuts (seats) for your rafters. First, calculate the pitch. Use 2x6 or 2x8 beams for the rafters. 2x4s will eventually start to sag.

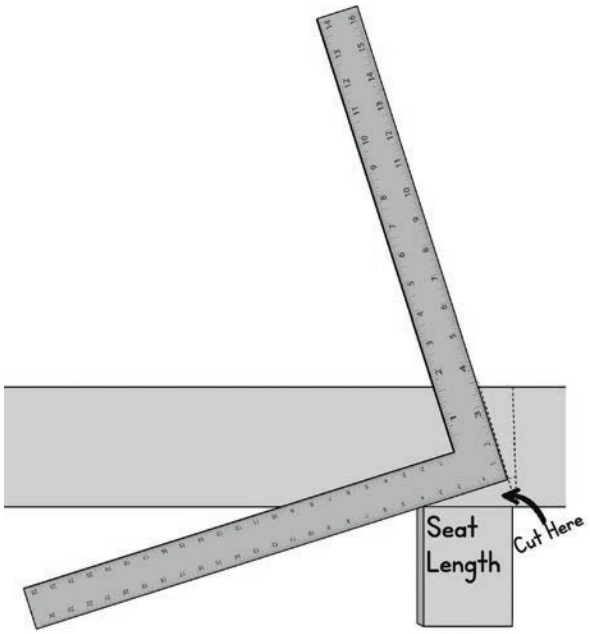
Divide rise by run, then multiply by 12.

For example: 24/78 x 12 = 3.69.



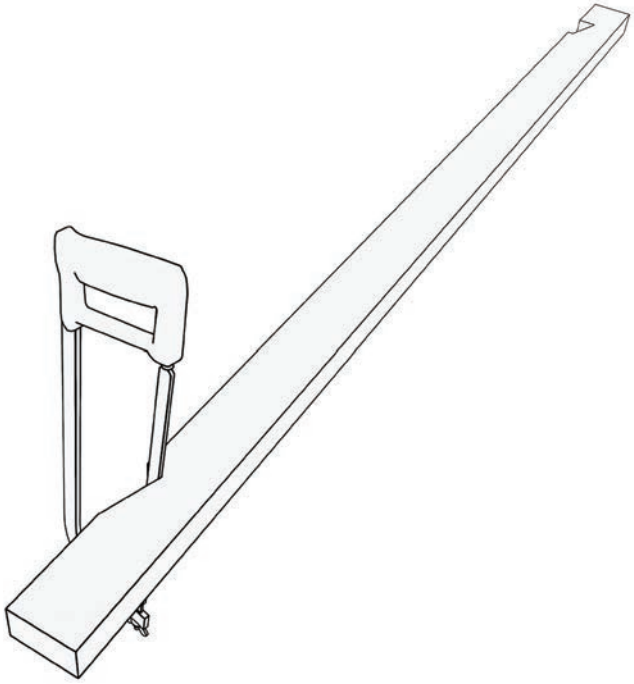
Once you calculate the pitch, use a speed square and a framing square to mark the birdsmouth cuts.

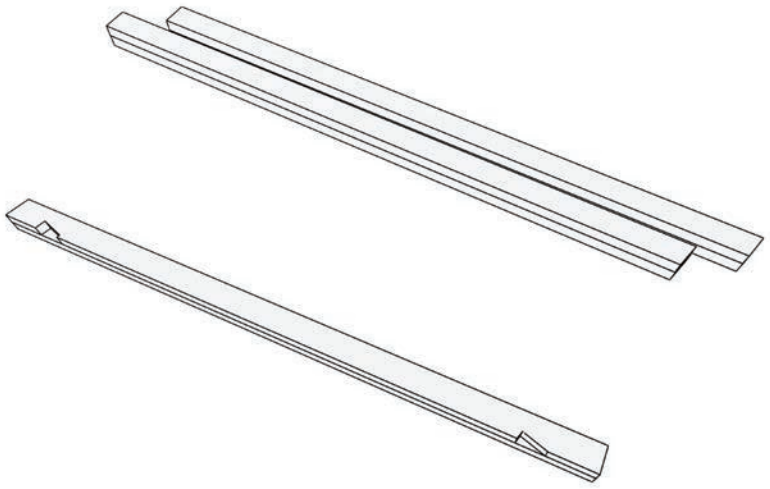


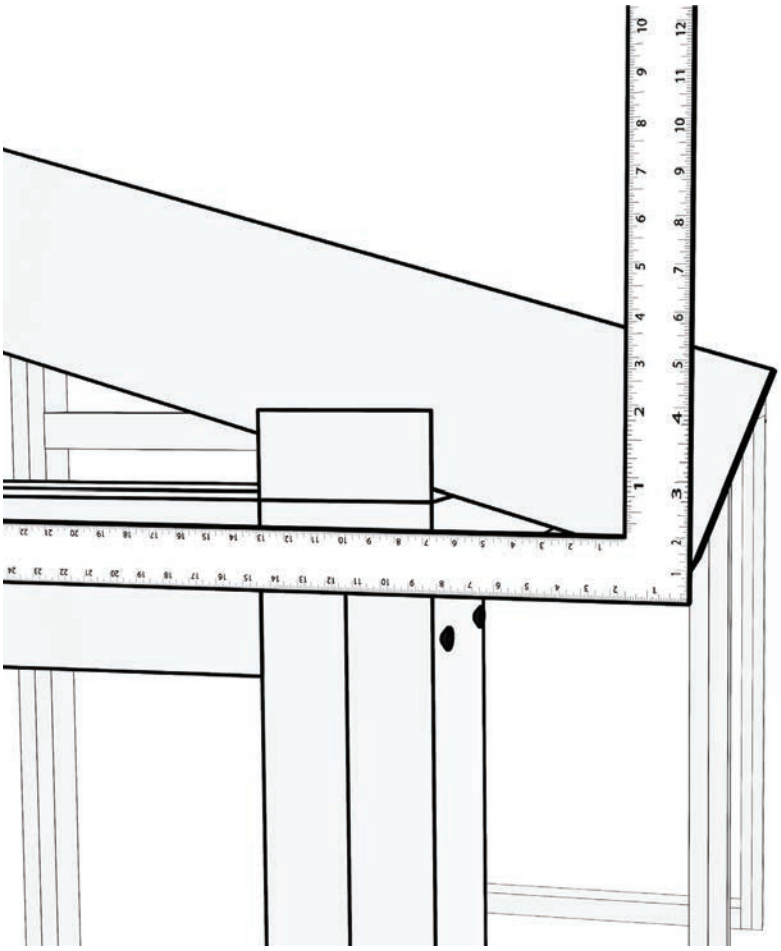


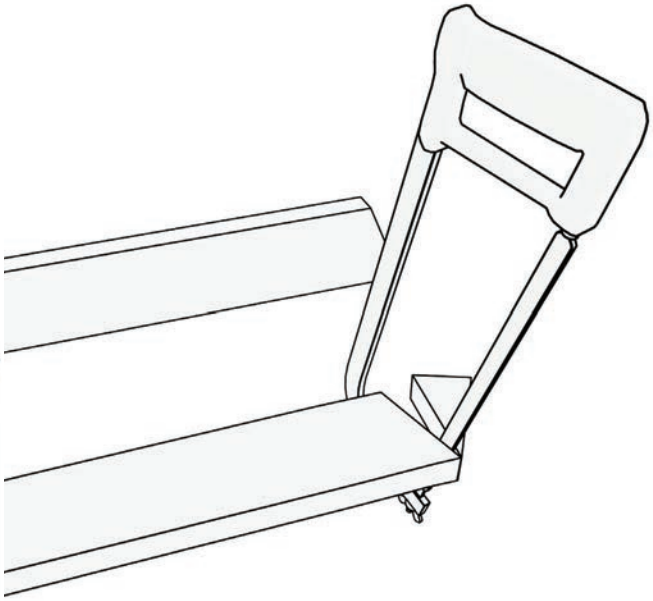
Trimming The Rafters

Cut the seats out where you marked them. Use the first rafter as a template to mark the other ones.







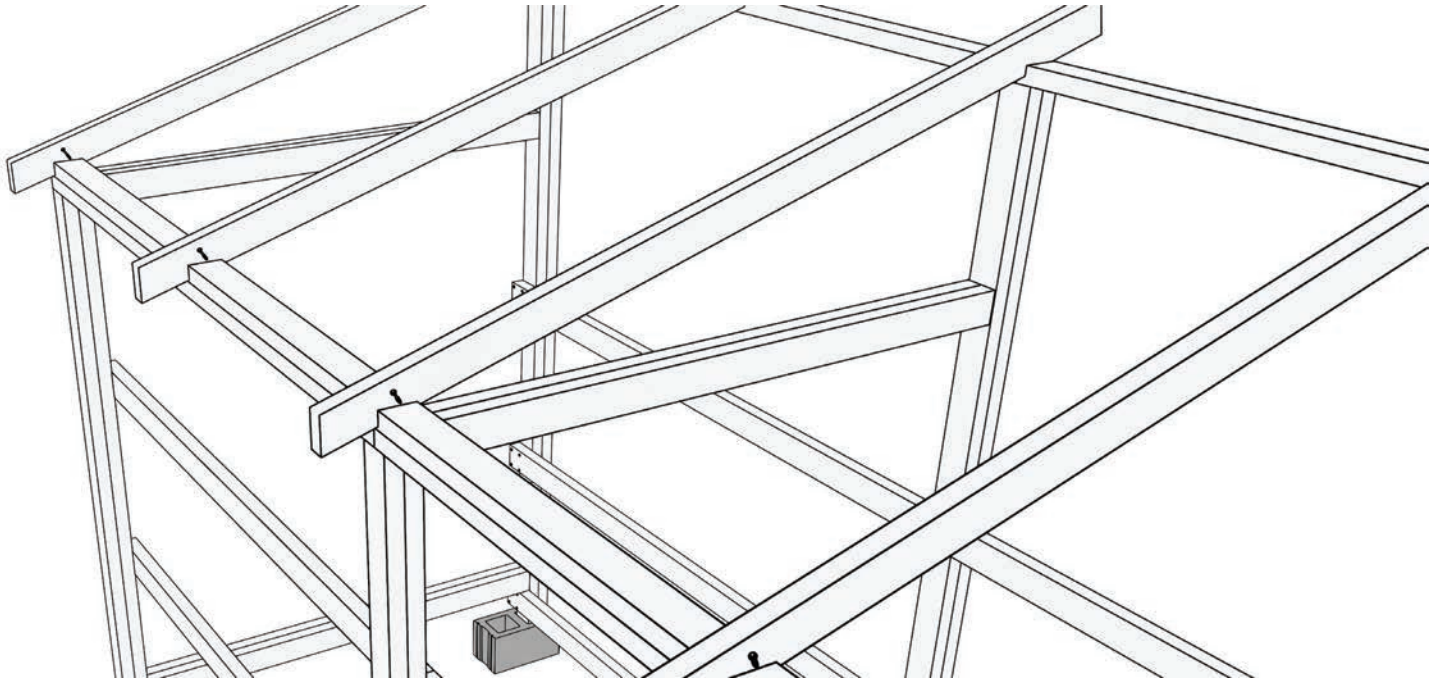


Cut a right angle on the bottom tail of the rafters. Mount the first rafter (without fastening it). Use a framing square and a level to mark a straight line.

You'll need this to mount the fascia board and hang the gutters later.

Putting on The Rafters

Now you're going to mount the rafters and screw (or nail) them by drilling or hammering them in at a diagonal angle. It's called toe-nailing.



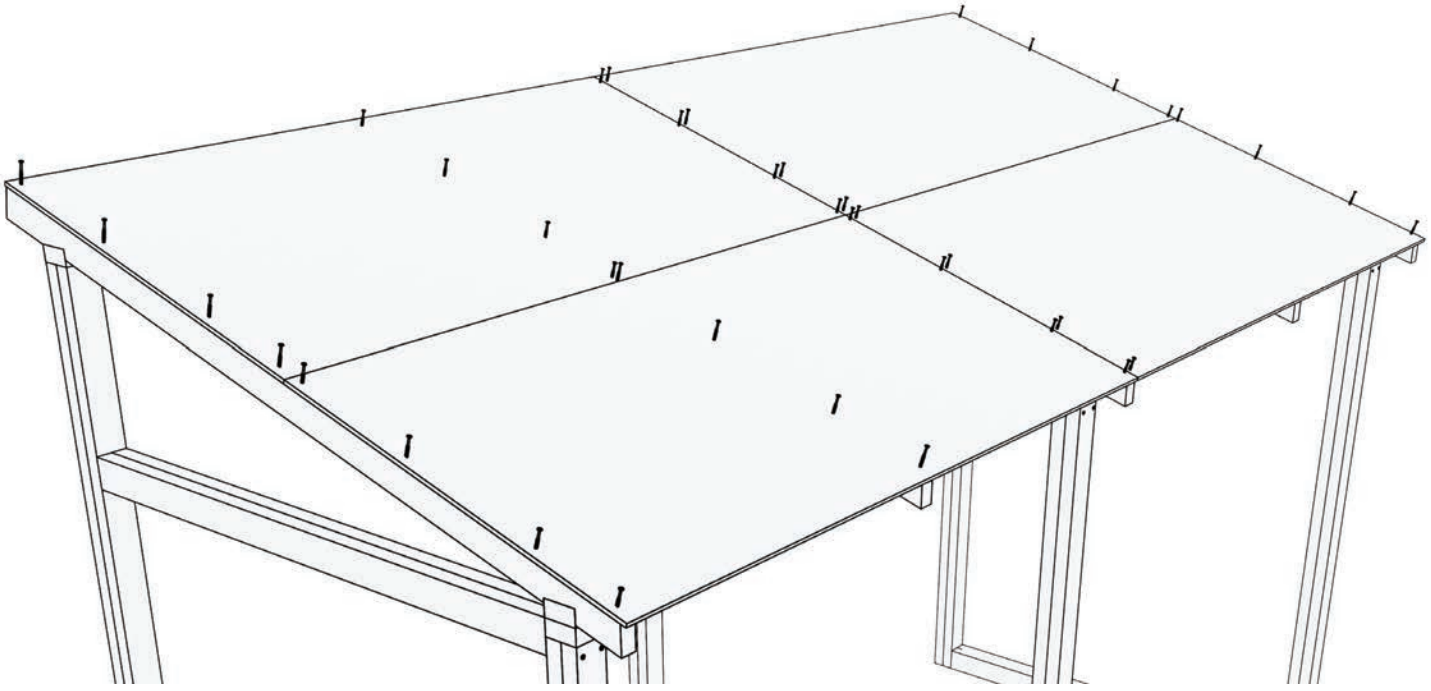
The frame will look like this when you're done. Now you're ready to attach the plywood sheathing.



Mounting The Sheathing

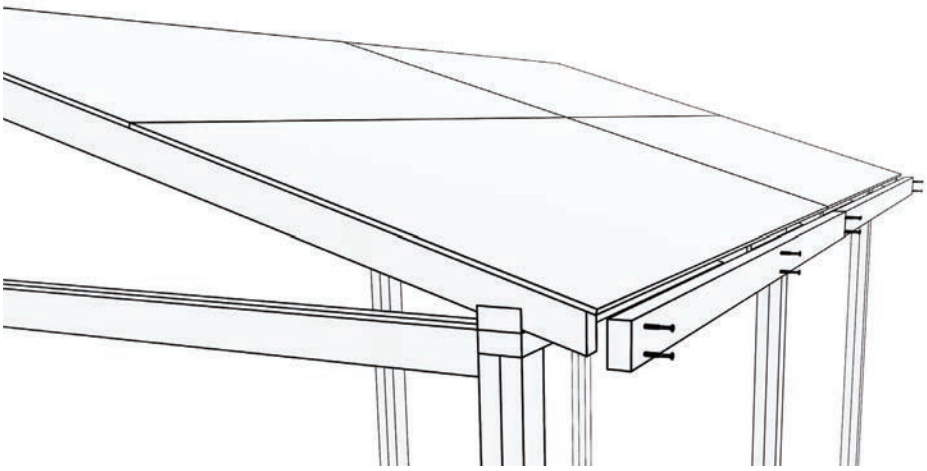
Use the studs as guides to mount the plywood.



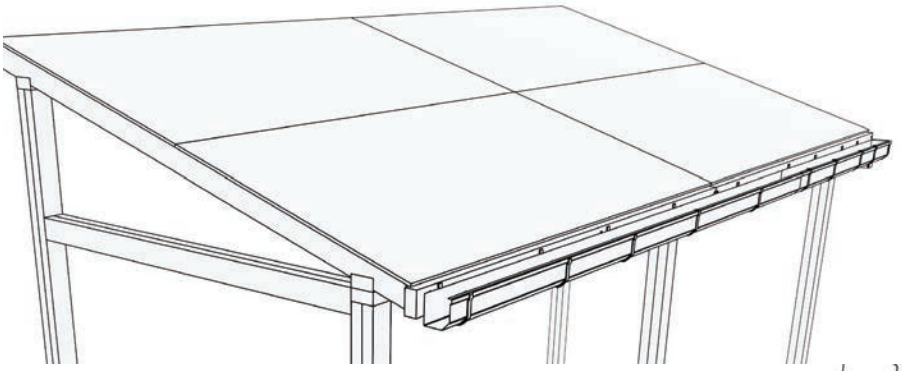


Putting on The Gutters

You need to attach the fascia and gutters before adding the final metal sheeting.

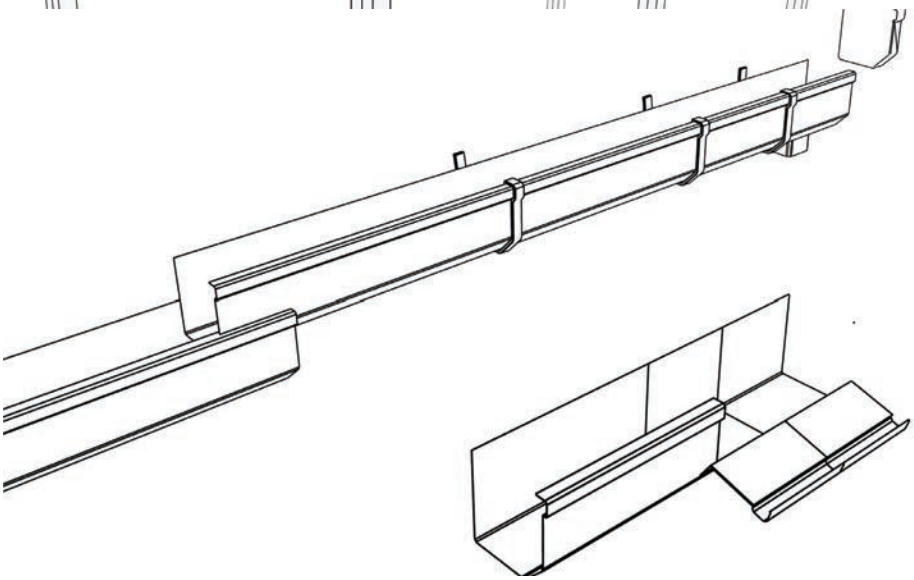


Fasten the fascia board into the rafters. Set it about an inch below the plywood sheathing to give the gutters room.

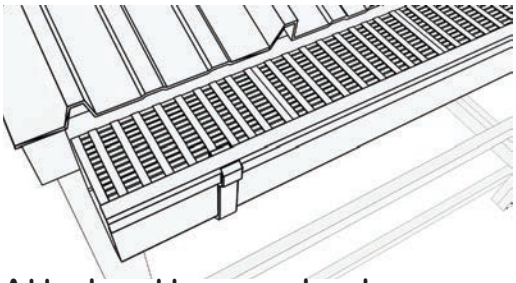


Hang the gutters at a slight slope toward the down outlet.

Gutter usually comes by 10 ft length, but you can trim it with tin snips. You can buy pieces with downspout outlets preinstalled, or you can measure and trim them with tin snips and toothsaws.



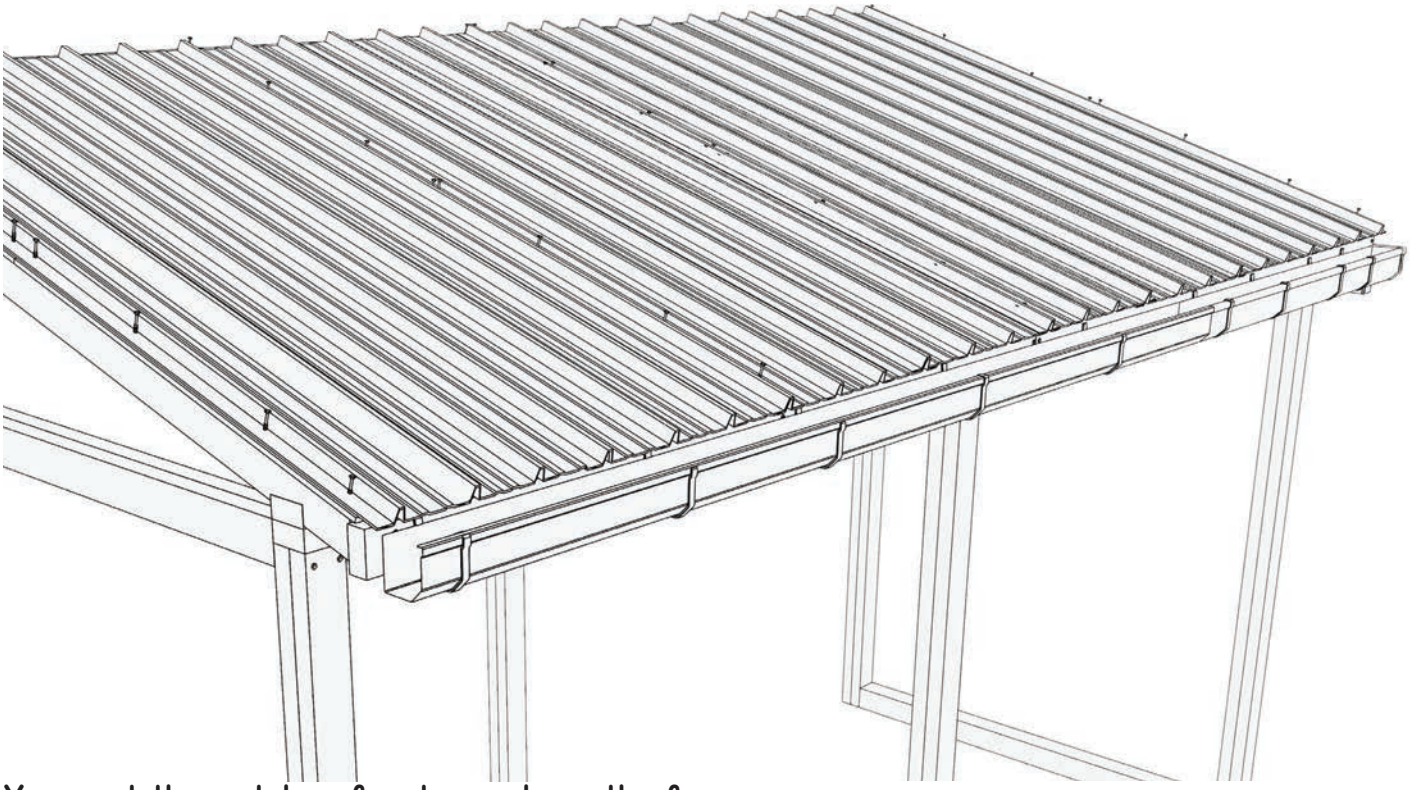
Attach gutter pieces with splice fittings, or you can just overlap the pieces by about 4 inches and seal them together. Do the same with end caps.



Attach gutter guards when you're done. They provide a first line of defense against leaves, critters, and other types of debris.

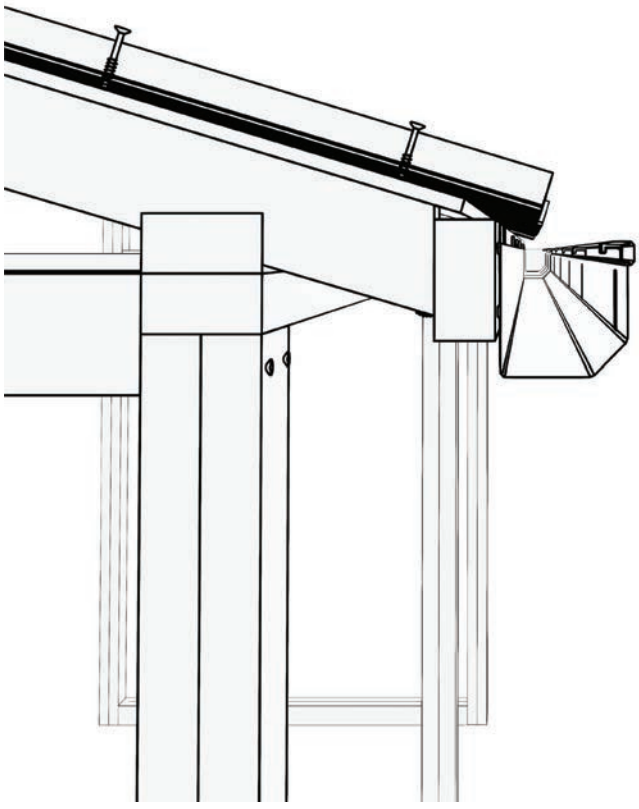
Putting on The Roof

Attach the roofing over the plywood sheathing. Follow the studs and overlap the metal sheets as you go. Metal roofing comes in various sizes, including 8x2 ft lengths, so it will go on easy.



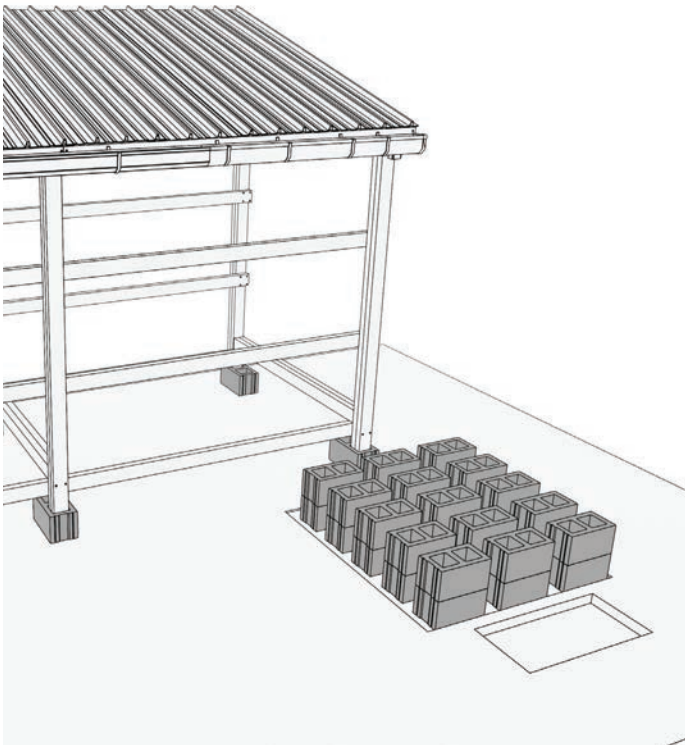
You want the metal roofing to overhang the fascia board by at least a couple of inches to ensure rain runs off the roof into the gutter.

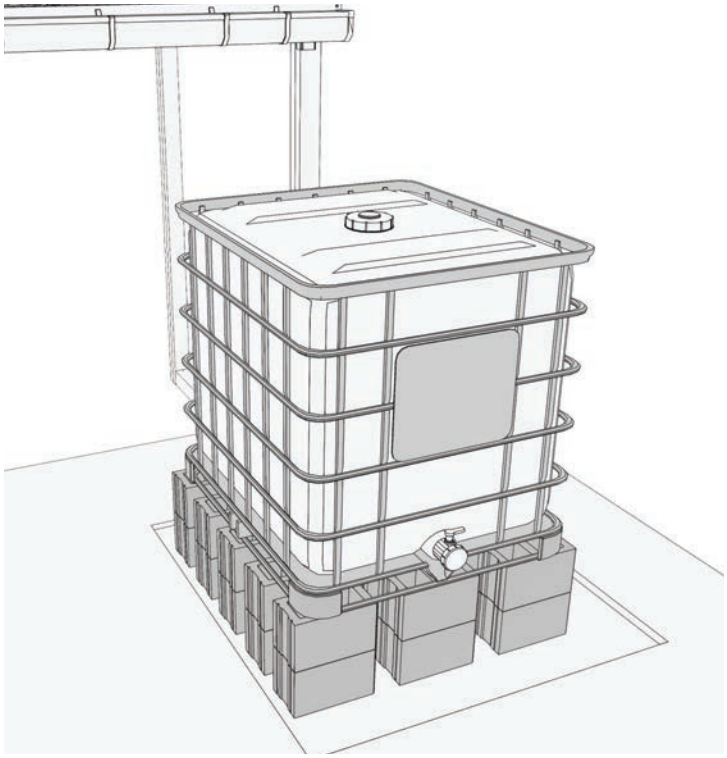
If you were installing a full roof onto a house or shed, you would put down waterproof underlayment and a slip sheet to protect against leaks. It's difficult to do, and you might not need it for this kind of structure.



Putting in The Tote

Most IBC Tote owners rest them on slab, paving stones, or cinder blocks. Dig a couple of inches out and pack the dirt before placing the blocks.

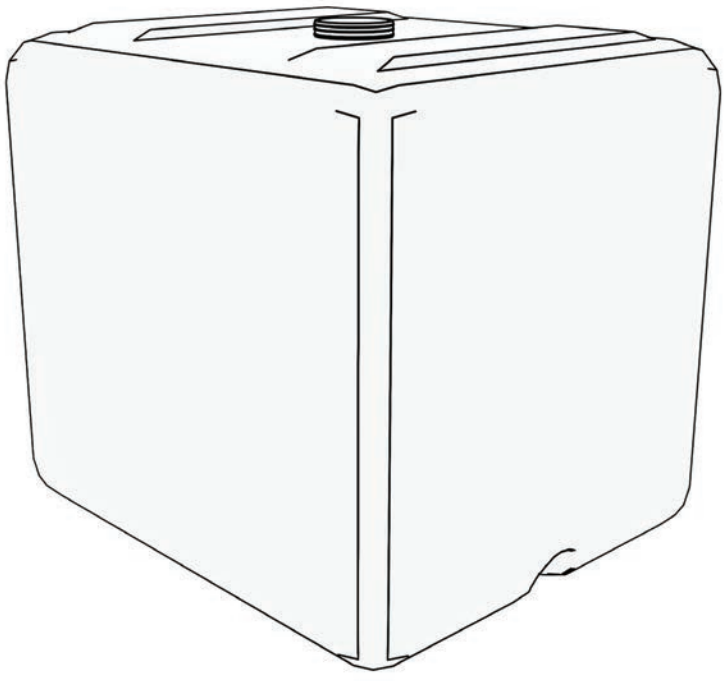




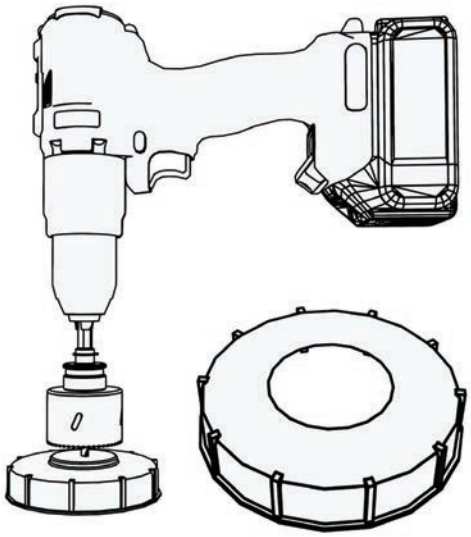
Totes get heavy when they're full. Packing the ground and resting it on cinder blocks ensures good clearance for the bottom valve, so you can fit containers under it.

IBC totes require a little modification for rainwater harvesting. First, cover them with IBC tote wrap or paint them with exterior latex or acrylic paint. Elastomeric paint works very well. This step protects your tank from algae growth.

Next, you'll need to modify the cap if you want to install piping with a tight seal. While you could just direct a gutter into the tote, that can still let in contaminants, even if you add screens and filters.



Hooking Up The Tote

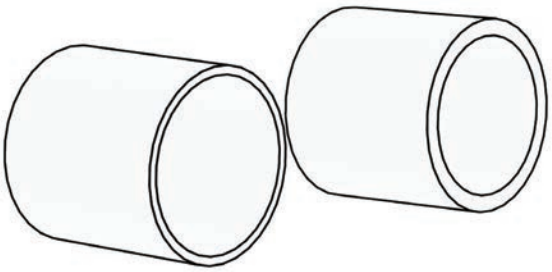


You can connect 3 inch or 4 inch PVC pipe to an IBC tote by modifying the cap. The outside diameter of Schedule 40 PVC measures 3/8 inch larger than the actual pipe size. So for a 3 inch pipe to fit, you need to make a 3 3/8 inch hole.

For the best and fastest results, use a hole saw, which attaches to a regular drill.

It's a good idea to cut a test hole into a bucket lid first, and keep a few spare IBC caps. You'll want them.

Now it's time to review some basic information about pipes.

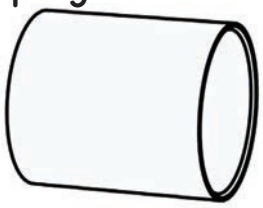


PVC comes in different types of thickness. Plumbers use Schedule 40 for most indoor plumbing. Schedule 80 handles even more pressure. Drain, Waste, and Vent (DWV) pipe works for systems with no pressure, like gravity-fed rain harvesting systems. Sewer and drainage (SD) pipe is even thinner.

DWV and Schedule 40 can be compatible, but it's always best to stick with the same thickness of pipe. When you're buying pipe, size refers to the interior dimension.

You fit pipe together with different types of fittings or couplings.

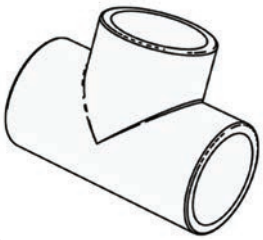
Coupling



Elbow



Tee



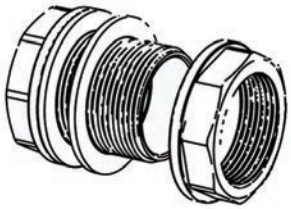
Reducer



Union



Bulkhead Union

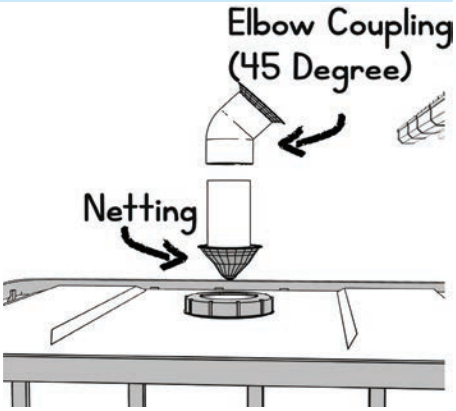


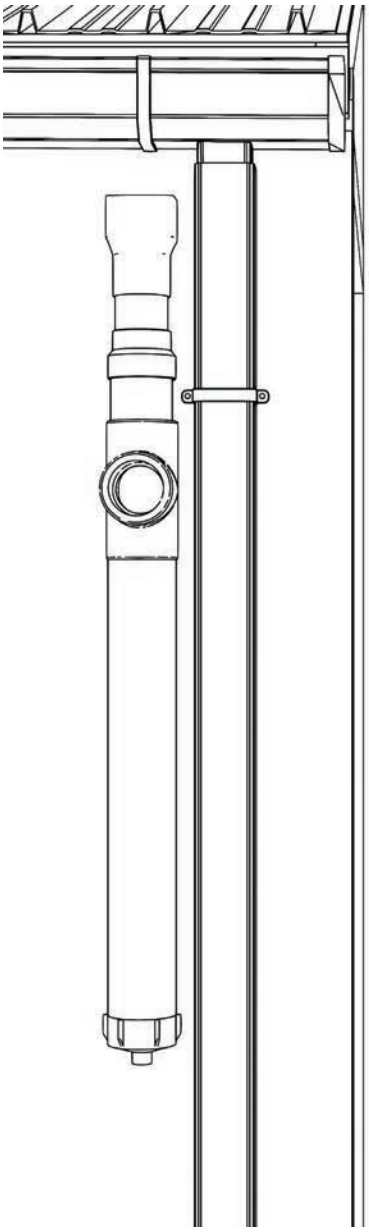
Male & Female Adapters

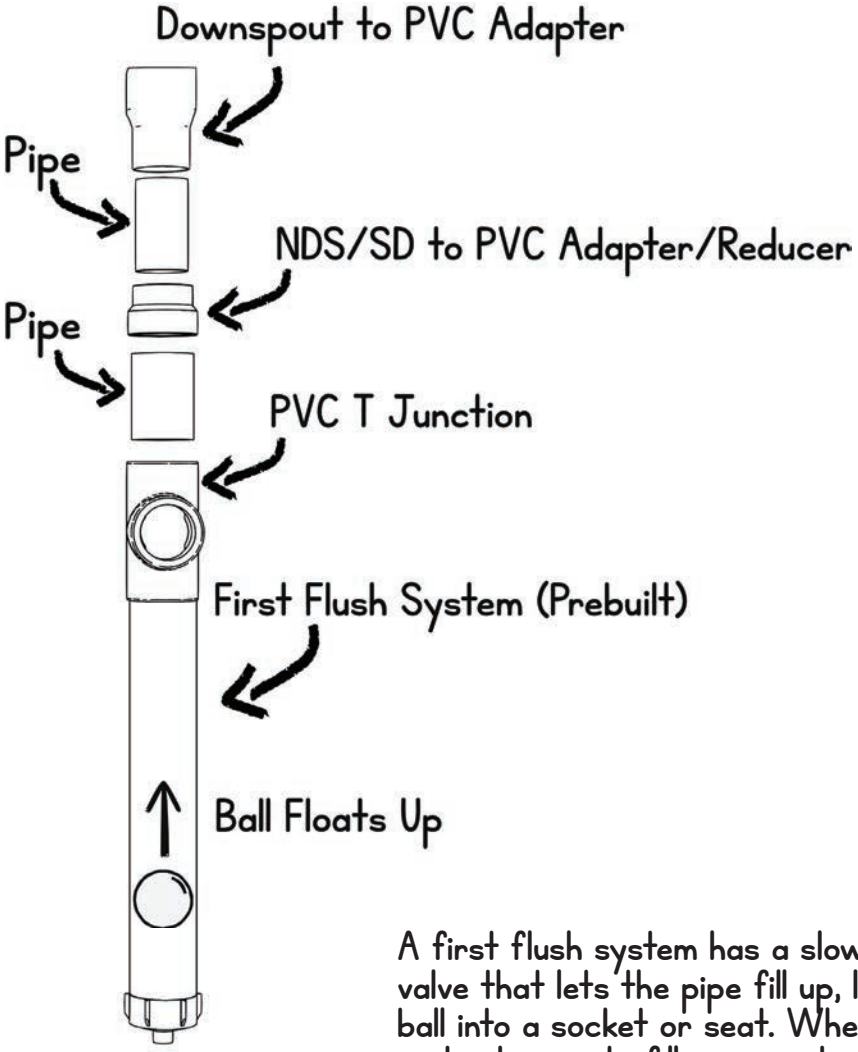


Filters and First Flush

Now you're going to assemble your first flush system and filters. You can use screen or mosquito head netting. Some homesteaders even use pantyhose. Not every homesteader uses a first flush system, but some insist. A first flush system helps eliminate debris and other contaminants before they reach your filters.





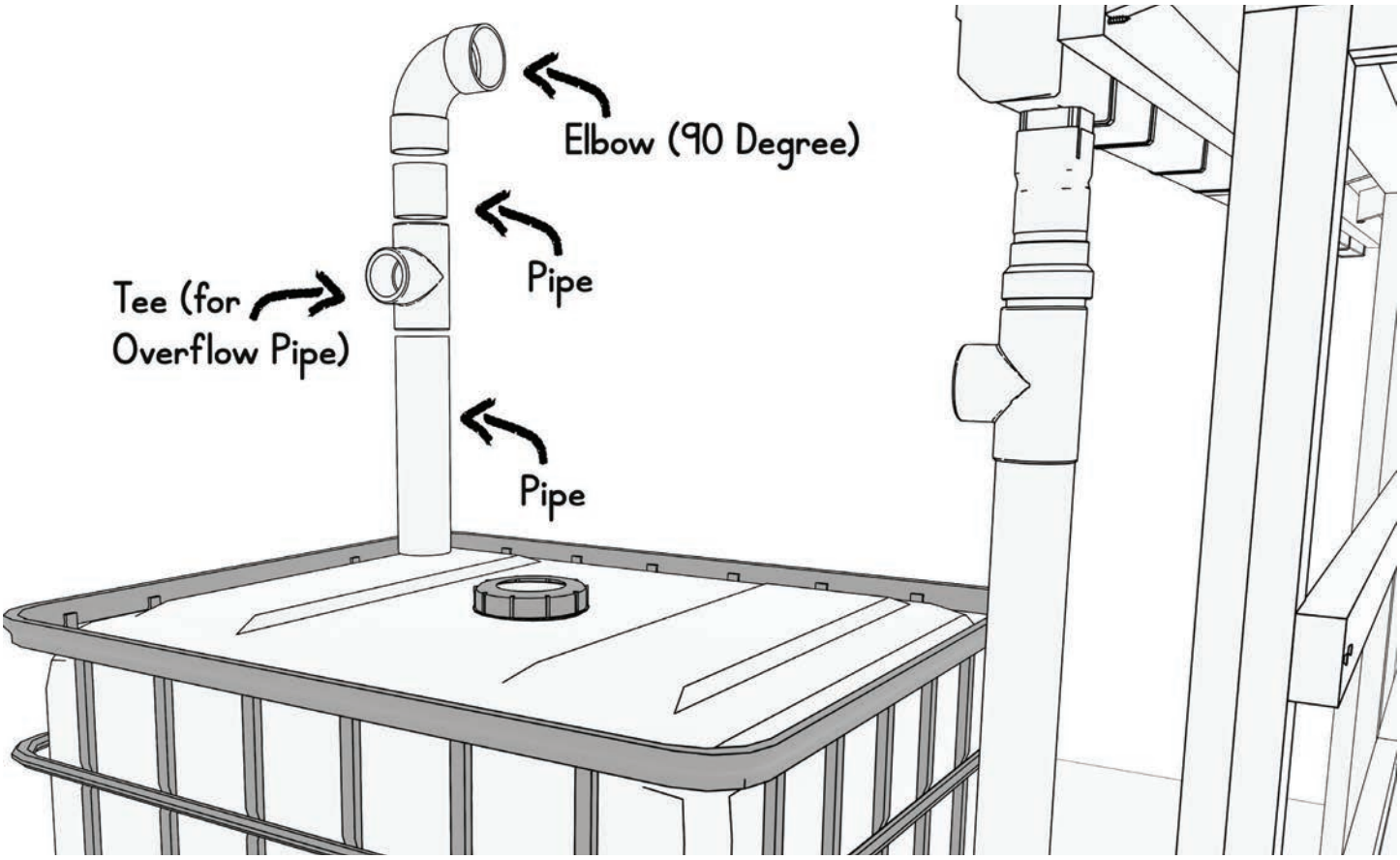


A first flush system has a slow release valve that lets the pipe fill up, lifting a ball into a socket or seat. When it's full, water begins to fill up your tank.

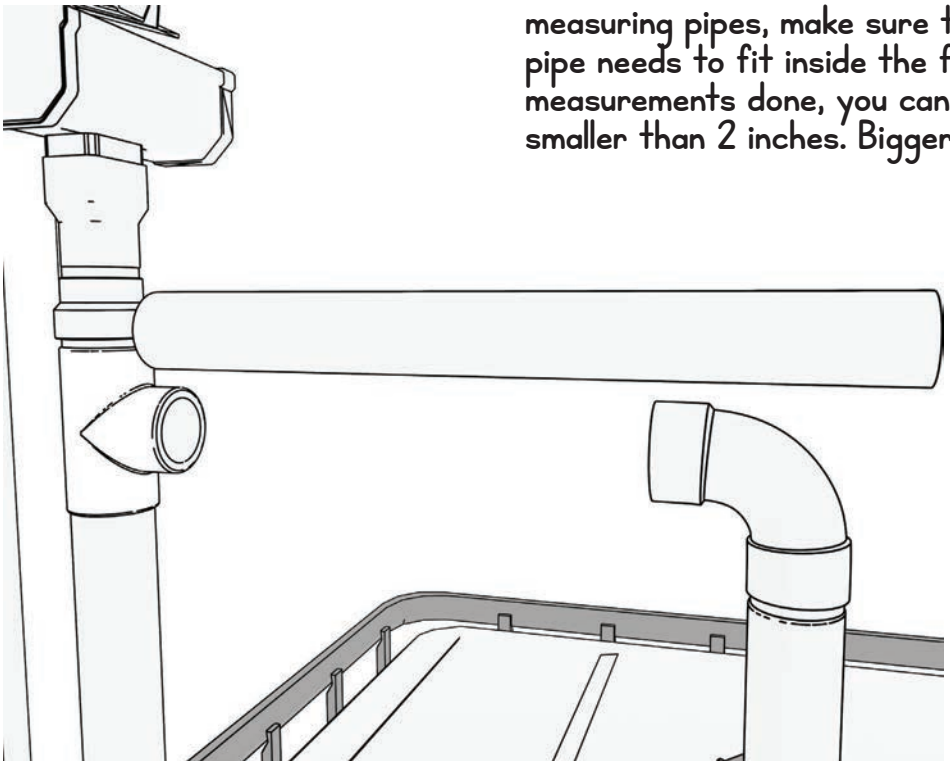
You'll be installing a downspout gutter and connecting it to PVC pipe. It's great if you can find a Schedule 40 adapter. If you can't, you can get an NDS/SD to Schedule 40 adapter. Before the final install with cement, measure and dry fit the pipes. When you're measuring, make sure you account for the inch or two pipes need to fit securely inside couplings on both ends.

Hooking Up The Rest

Now you're going to assemble the main connection to your tote. Leave the pipe that goes into your cap long for now, so you can adjust the length and make it even with your first flush system. Dry fit the pipes (without cement) so you can measure them.

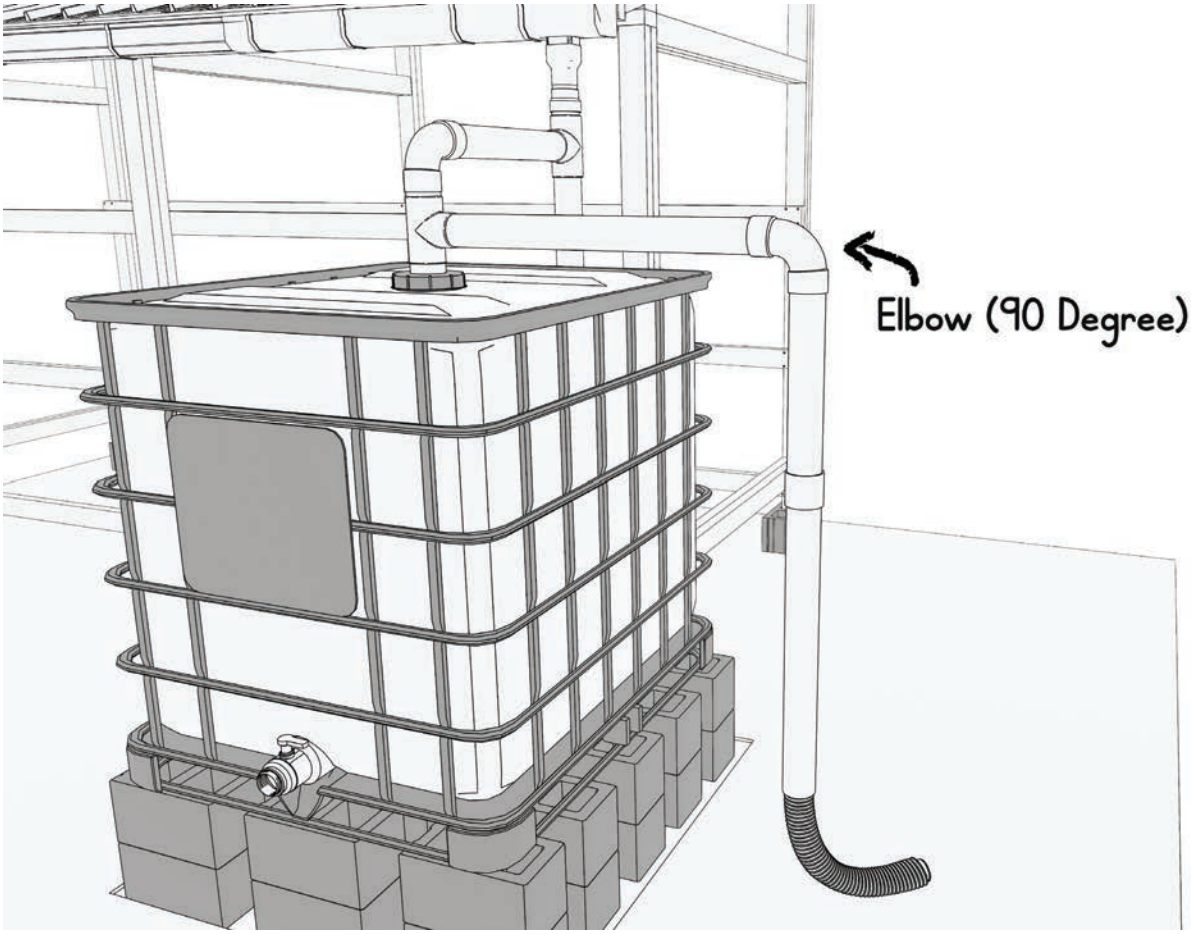


You'll measure the horizontal pipe last. Again: When you're measuring pipes, make sure to account for a few inches the pipe needs to fit inside the fittings. When you've got the measurements done, you can use a pipe cutter on most pipe smaller than 2 inches. Bigger pipe needs a hack saw.

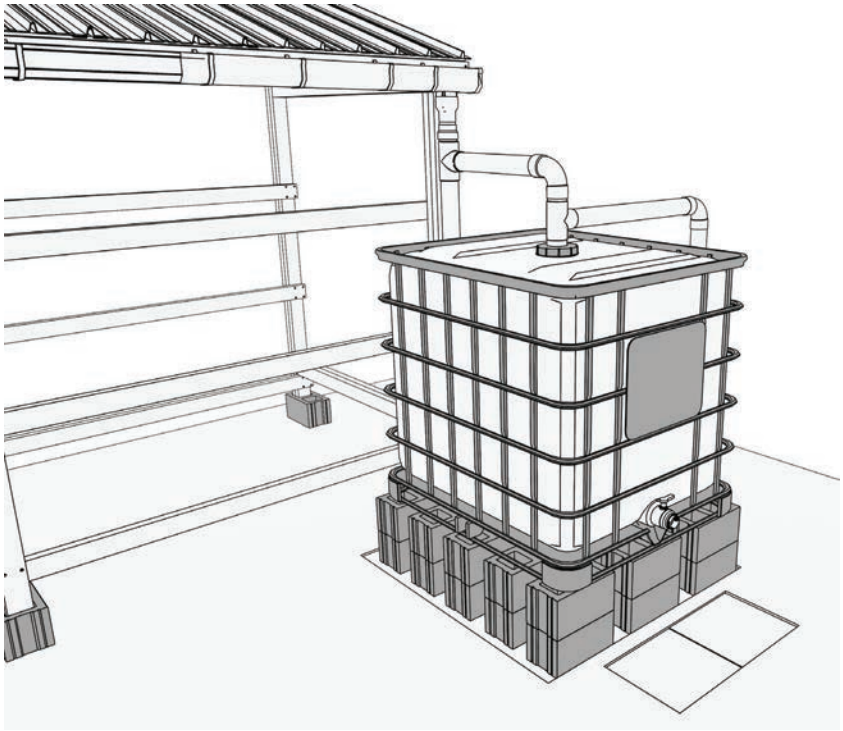


The Overflow Pipe

Once you've connected the first flush to your tote, you'll measure and connect the overflow pipe. When your IBC tote starts to overflow, water will travel out and toward the ground.



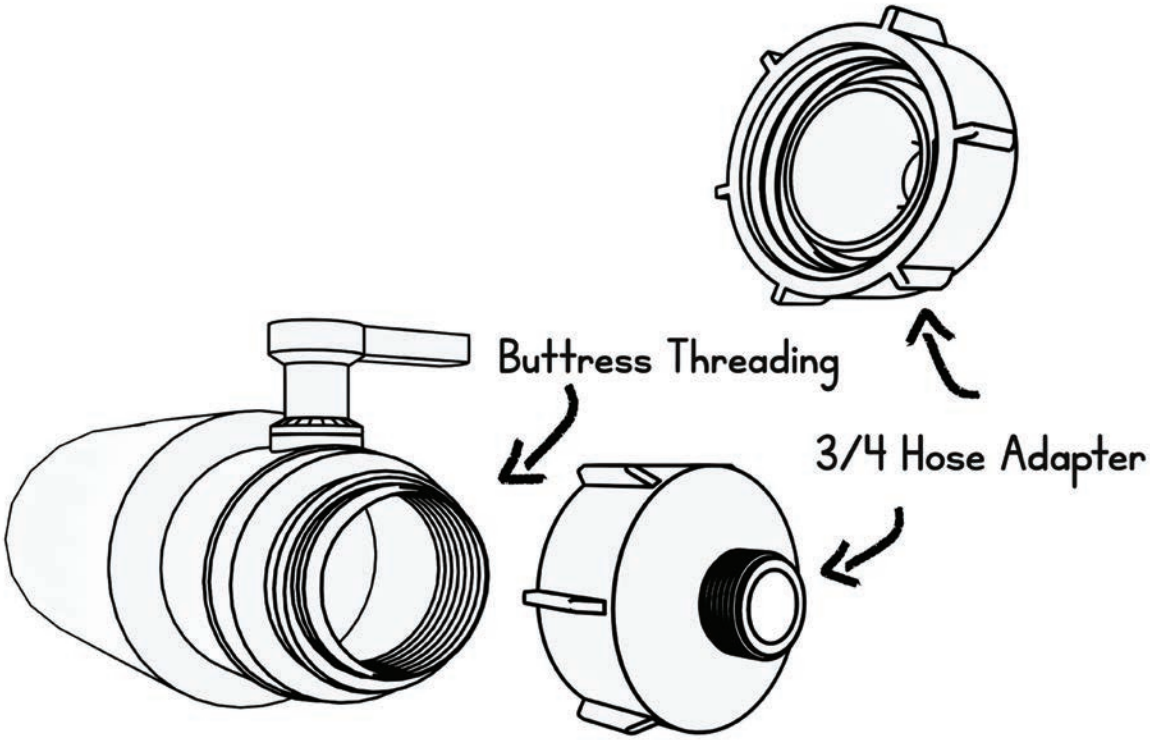
This is how your setup will look when it's done. If you need more space under the valve to fill buckets or other containers, you can dig out a filling area and add some paving stones.

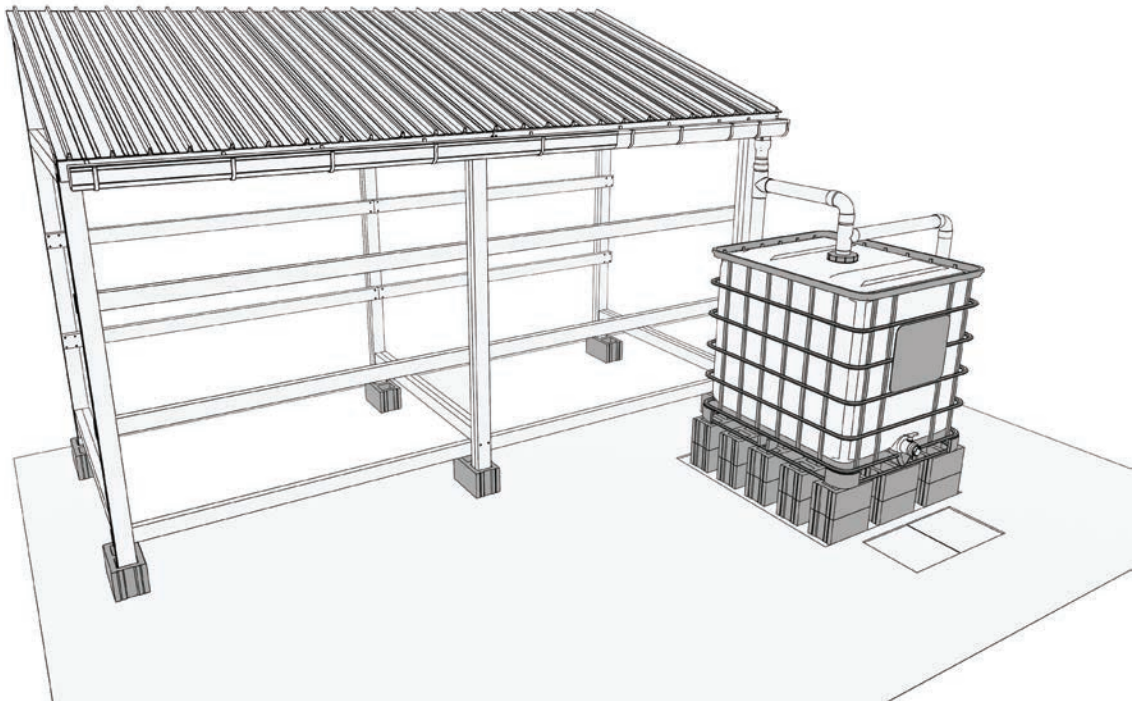


Using The Valve

The final hurdle to actually using your IBC tote: The valve. IBC Totes come with different types of threaded valves. Some come with NPT, the standard national pipe thread in the U.S. Others come with a coarser buttress thread, and a third kind comes with Camlock threading.

It can be hard to find adapters for the top cap, but it's not hard to find valve adapters. You can even find them on 3D print shops. You can connect valves to PVC, garden hose, and pretty much anything else.



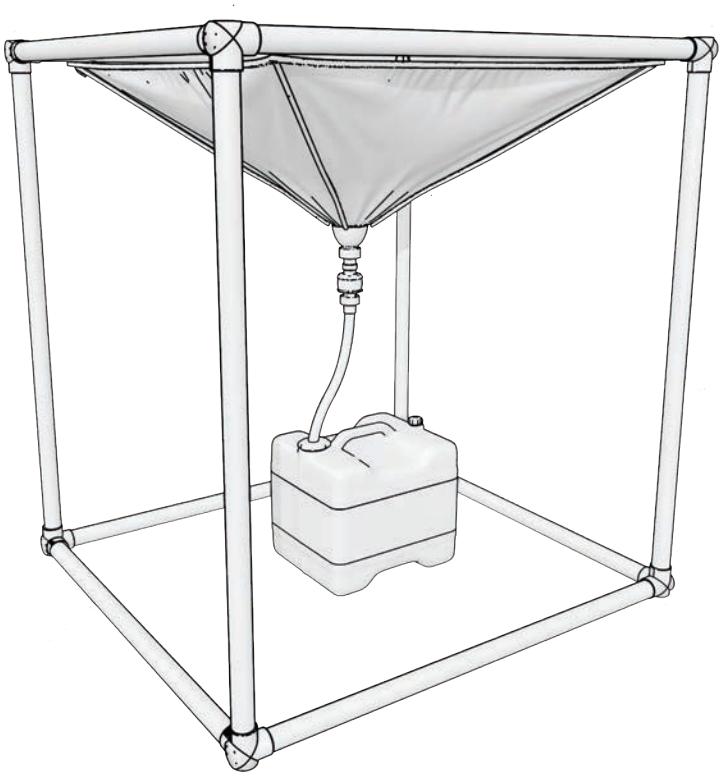


How to Harvest Dew (and Rain)

You can harvest water even if it doesn't rain. A warmer planet means the air retains more moisture. You can harness that moisture at night or during the early morning, when dew forms on cooler surfaces.

A number of portable rain harvesters are made with material that also collects dew, especially polyethylene.





You can make your own portable rain and dew harvesters with PVC pipe and leak diverters. Most of them are made with polyethylene or other materials that work well as dew collection surfaces.

Leak diverters come pre-made with funnels and hoses, so you just have to run them into a water container. You could even make your own leak diverter with plastic sheeting, funnels, and tubing.

You can make simple standalone structures to hang the leak diverters on. They usually come with hooks and cord, to make it simple. If you use thinner PVC pipe and fittings, you can even pack a kit like this into your bugout bag.

As a precaution, always filter the water and dew you catch.

Tapping Into Your Water Heater

Hang on your water heater!

How to access water from your water heater during an emergency

In an emergency, such as a severe winter storm or an earthquake, your home's water service may be temporarily unavailable.

If that occurs, your home's water heater could provide you with 30-80 gallons of water for drinking, cooking, and hygiene. (Tankless heaters do not provide this option.)

Before accessing water from your water heater:

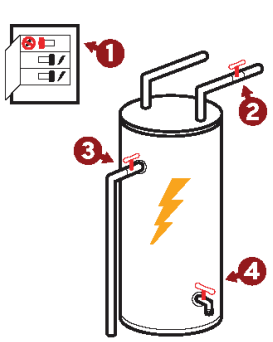
- **Locate your water heater:** Typically water heaters are located in the basement or garage of free standing homes, and in closets of apartments and manufactured homes.
- **Turn off your home's water supply:** Taking this step, especially after a big earthquake, could help ensure that the water remains in your tank, and that its quality isn't compromised or unsafe to use. Emergency water shut off valves are usually found in the basement, crawlspace, or garage of most homes, or outside by the home's foundation. Use this valve to turn your home's water supply off.

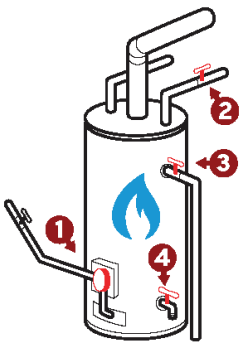
Instructions for accessing water from your water heater:

1 **Turn off your water heater's power source.** This step is crucial to ensuring your safety. You may want to keep a flashlight, safety goggles, gloves, and a screw driver in a location that is easily accessible.

Electric water heaters: Shut off your water heater's power by flipping the correct switch on your electrical panel. (Taking the time to correctly identify the correct circuit breaker beforehand is recommended.)

Natural gas water heaters: Locate the on/off switch on the water heater and turn the knob to the pilot setting – do not turn it completely off.





STEPS 2, 3 AND 4 ON REVERSE SIDE ➔

2 **Turn off your water heater's water supply.** Locate the water shut-off valve and turn it clockwise until it stops. This valve is typically located on the top of the water heater.

3 **Let air into your water heater.** You can do this by opening the relief valve (flip the handle so that it sticks straight up or out) located on the side of the tank or by turning on hot water spigots in the main living area or upstairs in your home. This will help release water from your water heater.

4 **Locate the drain valve at the bottom of your water heater and release water from your tank as needed.** Place a clean container under the drain valve spigot to capture the water and turn the spigot or screw of your water heater's drain valve to the left. **Be careful, because the water may be very hot. Wearing gloves and safety glasses for your protection is recommended.** Turn the spigot or screw to the right to stop the flow of water. Repeat this process as often as needed until the tank is empty.

Treat or filter any water that you use for drinking, food preparation and hygiene. Here's how:

- Bring the water to a rolling boil for at least one minute. Let it cool, and then use.

– OR –

- Put water in a sanitized container and treat it with unscented liquid chlorine bleach. To sanitize the container, vigorously shake a bleach solution (4 cups water and 1 teaspoon of bleach) for 30 seconds, making sure to cover all surfaces. Pour out solution and let air dry. Fill your container with water and treat it by adding 1/8 teaspoon of bleach per gallon.

– OR –

- Use a personal water filter to remove any bacteria or parasites. Be sure to carefully read and follow the manufacturer's instructions.

WATER HEATER MAINTENANCE TIPS

Water heater maintenance plays a critical role in the availability and quality of water contained in your water heater.

Properly brace your heater to the wall so that it is more likely to remain connected to the wall and your water system.

Flush your water heater annually. Doing this can significantly decrease the amount of sediment build up, and may improve the quality of the water in your water heater.

The Regional Water Providers Consortium provides leadership in the planning, management, stewardship, and resiliency of drinking water in the Portland, OR metropolitan region.

Get more information and resources at **www.regionalh2o.org.**

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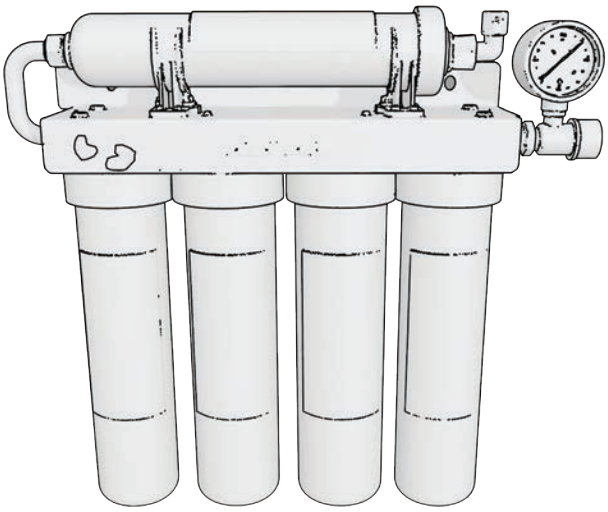
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Atmospheric Water Generators



Atmospheric water generators also provide water when it's not raining. Many preppers disregard them because they're expensive, but they work. Manufacturers cover their components in foodsafe materials and add water filtration systems to them. This alone makes them safer and more effective than simply using a dehumidifier.

One popular model, the H2O Machine, uses five-stage ultra-filtration to deliver clean drinking water, as long as the humidity stays above 40 percent.



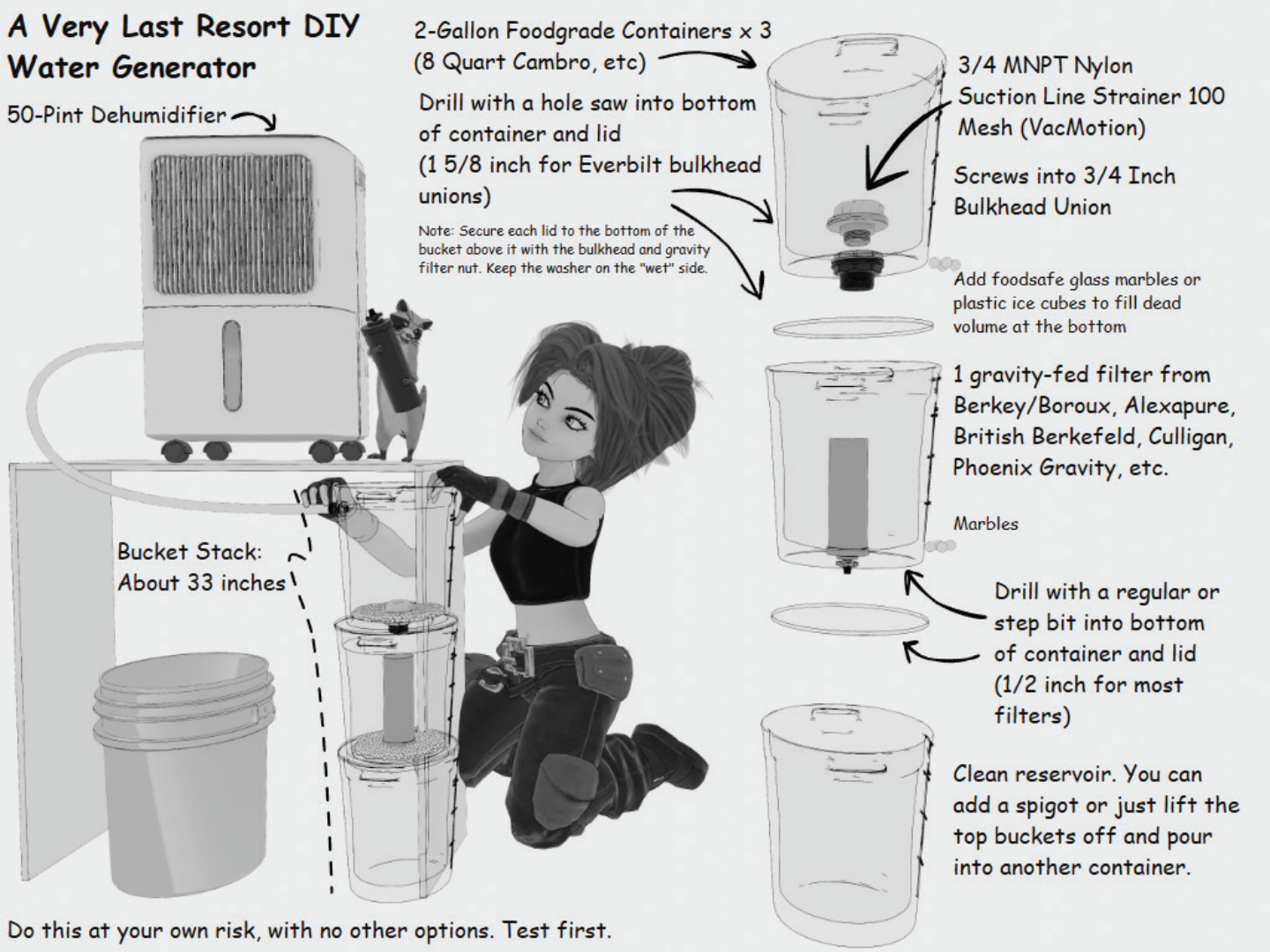


Atmospheric water generators do have one major downside. They consume a lot of electricity, often as much as a small air conditioner, especially when they're actively generating water. You need to leave them on all the time. When you turn them off for more than a few days, they need to reboot, which can take up to 72 hours. You also have to winterize or replace the filter components. Under normal operation, you have to replace the filters roughly every 18 months. That makes them useful during a medium term solution, but probably not a longterm one unless you have an independent power source, like rooftop solar.

You can drink water from a regular dehumidifier as a last resort, during an extreme emergency. Use the best filter you have for that water, because it will contain microbes and also trace metals. No filter company will officially recommend this, because it's a liability.



A DIY Water Generator



As a last resort, you can make a DIY water generator with a dehumidifier. We tested this water via the same lab service and it came back clean.

A 50-pint dehumidifier will produce several gallons of water over a 24-hour period. You can run this water into a bucket stack. The first bucket contains a suction-line strainer. This stage protects your carbon block filter. The final bottom bucket will hold your clean water.

To maximize safety and efficiency, try to run the dehumidifier later in the day or at night when you can open a window. This keeps the humidity higher. Also run an air purifier near the dehumidifier to keep the air clean.

Use a dedicated dehumidifier.

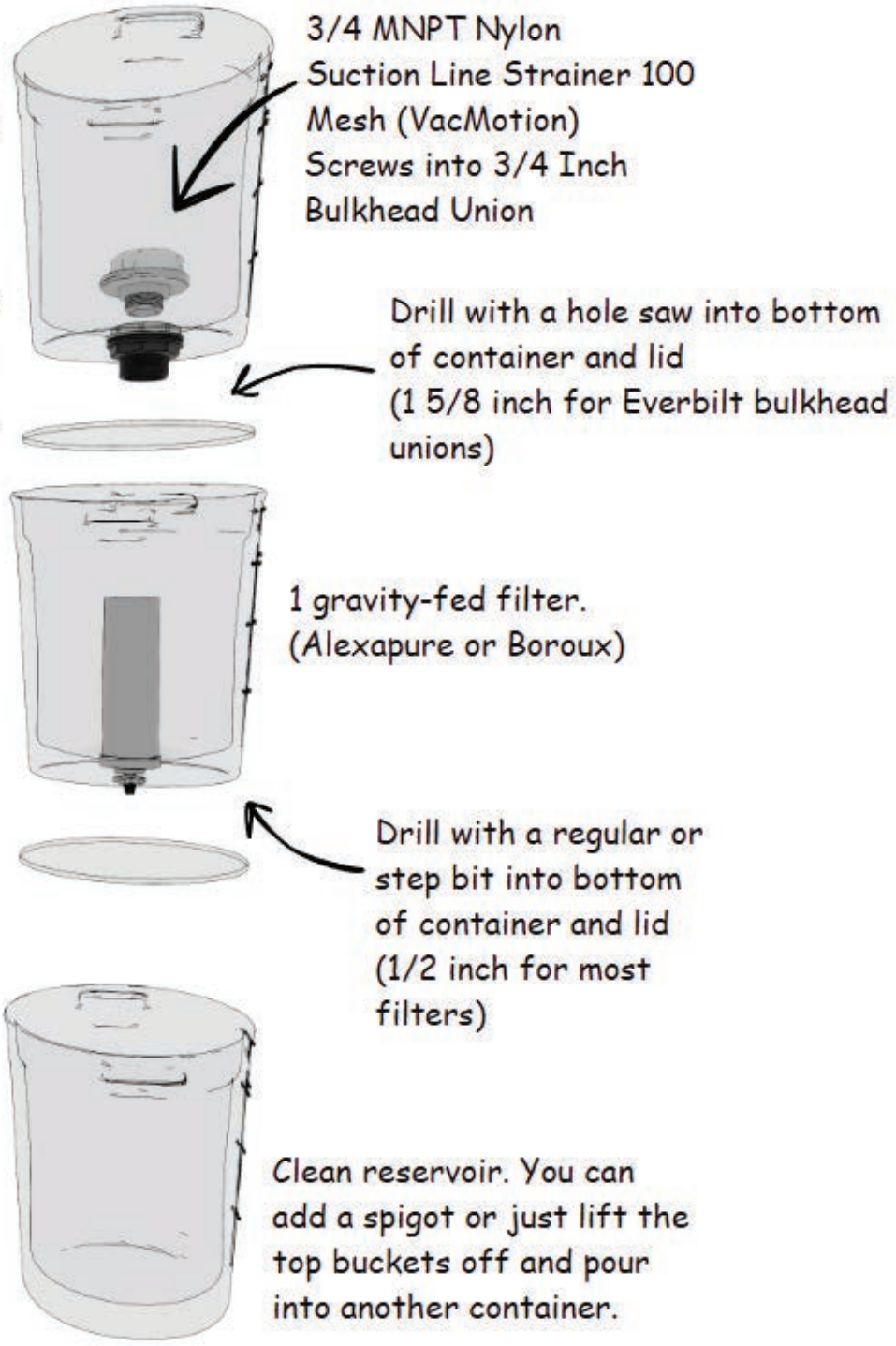
By that, we mean buying one new and only using it during water shortages or other emergencies. Clean it between uses.

If you move to smaller containers, you might not even need the glass marbles to fill up the dead volume space.

You can also run this water through a 3-stage RV filter for extra safety.

Any water generator uses anywhere from 300-500 watts. You'll need to pair this with a solar battery if you want to truly make it an emergency water source.

A DIY Water Generator



Above, you'll see a more detailed view of the filtration setup.

You can use whatever containers you like as long as they're the same size. Smaller containers work better for the gravity filters. Bigger containers won't fill up very high with only 1-2 gallons of water.

Your gravity filters need to be completely submerged to filter at their full pace. The filter's plastic base creates "dead volume" at bottom of any container. Narrow containers mean you need less water to submerge the filters.

In our testing, Rubbermaid 1-gallon Flex & Seal containers were the perfect fit.

Water Generator Lab Results

The test for filtered dehumidifier water concentrated on heavy metals, since that's the greatest immediate concern. The results came back very positive.

Boron Inorganics	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.00208 PPM	RL 0.02 PPM
Chloride Inorganics	4.37 PPM	No evaluation possible	EPA 300.0 MDL 0.081 PPM	RL 0.2 PPM
Fluoride Inorganics	1.44 PPM	Federal MCL: 4 PPM	EPA 300.0 MDL 0.0073 PPM	RL 0.1 PPM
Nitrate (as N) Inorganics	Not Detected *	No evaluation possible	EPA 300.0 MDL 0.035 PPM	RL 0.1 PPM
Phosphorus Inorganics	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.0466 PPM	RL 0.2 PPM
Sulfate Inorganics	1.04 PPM	No evaluation possible	EPA 300.0 MDL 0.0402 PPM	RL 0.2 PPM
Aluminum Metals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.0451 PPM	RL 0.2 PPM
Antimony Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000093 PPM	RL 0.001 PPM
Arsenic Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000174 PPM	RL 0.001 PPM
Barium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000157 PPM	RL 0.001 PPM
Beryllium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000309 PPM	RL 0.001 PPM
Cadmium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000235 PPM	RL 0.001 PPM
Chromium (Total) Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000281 PPM	RL 0.001 PPM
Cobalt Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000172 PPM	RL 0.001 PPM
Copper Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000564 PPM	RL 0.001 PPM
Iron Metals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.248 PPM	RL 2 PPM
Lead Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000183 PPM	RL 0.001 PPM
Lithium Metals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.00759 PPM	RL 0.02 PPM
Manganese Metals	0.00104 PPM	No evaluation possible	EPA 200.8 MDL 0.000554 PPM	RL 0.001 PPM

Mercury Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.00025 PPM	RL 0.00025 PPM
Molybdenum Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000299 PPM	RL 0.001 PPM
Nickel Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000234 PPM	RL 0.001 PPM
Selenium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.00158 PPM	RL 0.005 PPM
Silver Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000162 PPM	RL 0.001 PPM
Strontium Metals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.00235 PPM	RL 0.02 PPM
Thallium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000116 PPM	RL 0.001 PPM
Tin Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.00174 PPM	RL 0.005 PPM
Titanium Metals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.00208 PPM	RL 0.02 PPM
Uranium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000104 PPM	RL 0.001 PPM
Vanadium Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000178 PPM	RL 0.001 PPM
Zinc Metals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.00394 PPM	RL 0.02 PPM
Bicarbonate Minerals	31.8 PPM	No evaluation possible	Calculation	
Calcium Minerals	2.2 PPM	No evaluation possible	EPA 200.7 MDL 0.174 PPM	RL 2 PPM
Carbonate Minerals	0.0232 PPM	No evaluation possible	Calculation	
Magnesium Minerals	Not Detected *	No evaluation possible	EPA 200.7 MDL 0.192 PPM	RL 2 PPM
Potassium Minerals	2.06 PPM	No evaluation possible	EPA 200.7 MDL 0.236 PPM	RL 2 PPM
Sodium Minerals	Not Detected *	No evaluation possible	EPA 200.7 MDL 1.43 PPM	RL 2 PPM
Alkalinity (as CaCO3) Properties	26.1 PPM	No evaluation possible	SM 2320 B MDL 5 PPM	RL 5 PPM
Chloride-to-Sulfate Mass Ratio Properties	4.2	No evaluation possible	Calculation	
Expanded Hardness Properties	5.5 PPM	No evaluation possible	Calculation	
Grains per gallon Properties	0.321 Grains	No evaluation possible	Calculation	

The Ultimate Water Filter?



The Outback Ready Emergency Water Filter offers the best solution when you're sheltering in place, trying to filter water from a roof or a dehumidifier. We tested it ourselves. It meets basic federal standards for health and safety, even when you're filtering water straight from an asphalt shingle roof that contains heavy metals and VOCs.

Nothing is ever guaranteed, but this filter surpasses just about every other water filter on the market. As you can see here, it's much more than a simple 2-bucket DIY system. It even comes with a protective sleeve for the top pleated filter.

How does it work?

You simply collect water from a rain barrel or dehumidifier, using the hose-in-bucket method described earlier. You follow the setup instructions that come with your Outback. You pour the water into the top bucket, through the first sediment filter net.

The water filters from the top bucket through the black carbon filter in the bottom bucket. Yes, the carbon filter sits in the bottom bucket. It's screwed into the bottom of the top bucket, and it hangs suspended.

Government agencies and organizations ranging from the CDC and DOD to the Red Cross and the Peace Corps have all used the Outback. One filter set lasts for hundreds of gallons. Refer to the manual for exact lifespan. If you're filtering extremely dirty water, many prepping experts recommend scaling the lifespan down to 200-300 gallons.

For additional assurance, you can pour water from the Outback into a secondary cooler and add HOCl to ensure the elimination of viruses and bacteria, as described earlier.

Outback Filter Results

Parameter	Result	Evaluation: Federal MCL	Method, MDL and RL
E. coli Bacteria	Not Detected	No benchmark available	SM 9223B RL 1 P/A
Total Coliform Bacteria	Not Detected	No benchmark available	SM 9223B RL 1 P/A
Bromochloromethane Disinfection Byproducts	Not Detected *	No benchmark available	EPA 524.2 MDL 0.292 PPB RL 0.5 PPB
Bromodichloromethane Disinfection Byproducts	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.184 PPB RL 0.5 PPB
Bromoform Disinfection Byproducts	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.203 PPB RL 0.5 PPB
Chloroform Disinfection Byproducts	1.8 PPB	Federal MCL: 80 PPB	EPA 524.2 MDL 0.372 PPB RL 0.5 PPB
Dibromochloromethane Disinfection Byproducts	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.175 PPB RL 0.5 PPB
Dibromomethane Disinfection Byproducts	Not Detected *	No benchmark available	EPA 524.2 MDL 0.197 PPB RL 0.5 PPB
Total THMs Disinfection Byproducts	1.8 (Total) PPB	Federal MCL: 80 PPB	Calculation
Boron Inorganics	Not Detected *	No benchmark available	EPA 200.7 MDL 0.00579 PPM RL 0.03 PPM
Chloride Inorganics	96.5 PPM	No benchmark available	EPA 300.0 MDL 1.18 PPM RL 2.5 PPM
Fluoride Inorganics	Not Detected *	No evaluation possible	EPA 300.0 MDL 0.0403 PPM RL 0.5 PPM
Nitrate (as N) Inorganics	Not Detected *	No evaluation possible	EPA 300.0 MDL 0.015 PPM RL 0.125 PPM
Nitrite (as N) Inorganics	Not Detected *	No evaluation possible	EPA 300.0 MDL 0.05 PPM RL 0.125 PPM
Phosphorus Inorganics	1.04 PPM	No benchmark available	EPA 200.7 MDL 0.0294 PPM RL 0.2 PPM
Silica Inorganics	5.18 PPM	No benchmark available	EPA 200.7 MDL 0.142 PPM RL 0.214 PPM
Sulfate Inorganics	4.66 PPM	No benchmark available	EPA 300.0 MDL 1.62 PPM RL 2.5 PPM
Aluminum Metals	Not Detected *	No benchmark available	EPA 200.7 MDL 0.142 PPM RL 0.2 PPM
Antimony Metals	0.00242 PPM	Federal MCL: 0.006 PPM	EPA 200.8 MDL 0.000368 PPM RL 0.0008 PPM
Arsenic Metals	Not Detected *	No evaluation possible	EPA 200.8 MDL 0.000308 PPM RL 0.002 PPM

Barium Metals	**0.0108** PPM	Federal MCL: 2 PPM	**EPA 200.8** MDL 0.000192 PPM	RL 0.0008 PPM
Beryllium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000229 PPM	RL 0.0008 PPM
Cadmium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000208 PPM	RL 0.0008 PPM
Chromium (Total) Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.00086 PPM	RL 0.004 PPM
Cobalt Metals	**Not Detected ***	No benchmark available	**EPA 200.8** MDL 0.000146 PPM	RL 0.0008 PPM
Copper Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.00153 PPM	RL 0.01 PPM
Iron Metals	**Not Detected ***	No benchmark available	**EPA 200.7** MDL 0.072 PPM	RL 0.2 PPM
Lead Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000242 PPM	RL 0.0008 PPM
Lithium Metals	**0.00199** PPM	No benchmark available	**EPA 200.7** MDL 0.00018 PPM	RL 0.001 PPM
Manganese Metals	**0.0041** PPM	No benchmark available	**EPA 200.8** MDL 0.0005 PPM	RL 0.0008 PPM
Mercury Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000138 PPM	RL 0.0008 PPM
Molybdenum Metals	**Not Detected ***	No benchmark available	**EPA 200.8** MDL 0.000124 PPM	RL 0.0008 PPM
Nickel Metals	**Not Detected ***	No benchmark available	**EPA 200.8** MDL 0.002 PPM	RL 0.01 PPM
Selenium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000362 PPM	RL 0.002 PPM
Silver Metals	**0.00553** PPM	No benchmark available	**EPA 200.8** MDL 0.000612 PPM	RL 0.0008 PPM
Strontium Metals	**Not Detected ***	No benchmark available	**EPA 200.7** MDL 0.00505 PPM	RL 0.05 PPM
Thallium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.000193 PPM	RL 0.0008 PPM
Tin Metals	**Not Detected ***	No benchmark available	**EPA 200.8** MDL 0.000242 PPM	RL 0.0008 PPM
Titanium Metals	**Not Detected ***	No benchmark available	**EPA 200.7** MDL 0.000824 PPM	RL 0.002 PPM
Uranium Metals	**Not Detected ***	No evaluation possible	**EPA 200.8** MDL 0.0000483 PPM	RL 0.0008 PPM
Vanadium Metals	**Not Detected ***	No benchmark available	**EPA 200.8** MDL 0.000706 PPM	RL 0.004 PPM
Zinc Metals	**Not Detected ***	No benchmark available	**EPA 200.7** MDL 0.00428 PPM	RL 0.01 PPM
Bicarbonate Minerals	**28.3** PPM	No benchmark available	**Calculation**	

Calcium Minerals	**4.13** PPM	No benchmark available	**EPA 200.7** MDL 0.085 PPM	RL 0.2 PPM
Carbonate Minerals	**0.0164** PPM	No benchmark available	**Calculation**	
Magnesium Minerals	**2.11** PPM	No benchmark available	**EPA 200.7** MDL 0.0182 PPM	RL 0.2 PPM
Potassium Minerals	**35.8** PPM	No benchmark available	**EPA 200.7** MDL 0.192 PPM	RL 0.2 PPM
Sodium Minerals	**39.2** PPM	No benchmark available	**EPA 200.7** MDL 0.177 PPM	RL 0.2 PPM
cis 1,3 Dichloropropene Pesticides	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.179 PPB	RL 0.5 PPB
trans 1,3 Dichloropropene Pesticides	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.23 PPB	RL 0.5 PPB
Benzene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.211 PPB	RL 0.5 PPB
Ethylbenzene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.349 PPB	RL 0.5 PPB
m,p Xylene Petroleum Compounds	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.857 PPB	RL 1 PPB
Methyl Tertiary Butyl Ether Petroleum Compounds	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.215 PPB	RL 0.5 PPB
Naphthalene Petroleum Compounds	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.398 PPB	RL 0.5 PPB
o Xylene Petroleum Compounds	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.346 PPB	RL 0.5 PPB
Toluene Petroleum Compounds	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.244 PPB	RL 0.5 PPB
Alkalinity (as CaCO3) Properties	**23.2** PPM	No benchmark available	**SM 2320 B** RL 20 PPM	
Chloride-to-Sulfate Mass Ratio Properties	**20.7**	No benchmark available	**Calculation**	
Expanded Hardness Properties	**19** PPM	No benchmark available	**Calculation**	
Grains per gallon Properties	**1.11** Grains	No benchmark available	**Calculation**	
Hardness Properties	**19** PPM	No benchmark available	**SM 2340 B** MDL 0.287 PPM	RL 1.32 PPM
Langelier Saturation Index Properties	**-2.54**	No benchmark available	**Calculation**	
pH Properties	**7.1**	No benchmark available	**SM 4500-H+B** RL 0.01 pH	
Sodium Adsorption Ratio Properties	**3.91**	No benchmark available	**Calculation**	
Specific Conductivity Properties	**397** umhos/cm	No benchmark available	**SM 2510 B** RL 2 umhos/cm	

Total Dissolved Solids Properties	**232** PPM	No benchmark available	**SM 2510 B** MDL 1.92 PPM	RL 1.92 PPM
Turbidity Properties	**3.6** NTU	No benchmark available	**EPA 180.1** MDL 0.22 NTU	RL 0.5 NTU
1,1 Dichloroethane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.325 PPB	RL 0.5 PPB
1,1 Dichloroethylene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.238 PPB	RL 0.5 PPB
1,1 Dichloropropene VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.179 PPB	RL 0.5 PPB
1,1,1 Trichloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.146 PPB	RL 0.5 PPB
1,1,1,2 Tetrachloroethane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.185 PPB	RL 0.5 PPB
1,1,2 Trichloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.179 PPB	RL 0.5 PPB
1,1,2,2-Tetrachloroethane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.208 PPB	RL 0.5 PPB
1,2 Dichlorobenzene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.252 PPB	RL 0.5 PPB
1,2 Dichloroethane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.192 PPB	RL 0.5 PPB
1,2 Dichloropropane VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.2 PPB	RL 0.5 PPB
1,2,3 Trichlorobenzene VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.325 PPB	RL 0.5 PPB
1,2,3 Trichloropropane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.223 PPB	RL 0.5 PPB
1,2,4 Trichlorobenzene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.239 PPB	RL 0.5 PPB
1,2,4 Trimethylbenzene VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.44 PPB	RL 0.5 PPB
1,3 Dichlorobenzene VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.268 PPB	RL 0.5 PPB
1,3 Dichloropropane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.176 PPB	RL 0.5 PPB
1,3,5 Trimethylbenzene VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.471 PPB	RL 0.5 PPB
1,4 Dichlorobenzene VOCs	**Not Detected ***	No evaluation possible	**EPA 524.2** MDL 0.309 PPB	RL 0.5 PPB
2,2 Dichloropropane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.473 PPB	RL 0.5 PPB
Bromobenzene VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.239 PPB	RL 0.5 PPB
Bromomethane VOCs	**Not Detected ***	No benchmark available	**EPA 524.2** MDL 0.316 PPB	RL 0.5 PPB

Carbon Tetrachloride VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.198 PPB	RL 0.5 PPB
Chlorobenzene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.211 PPB	RL 0.5 PPB
Chloroethane VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.236 PPB	RL 0.5 PPB
Chloromethane VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.181 PPB	RL 0.5 PPB
Chlorotoluene 2 VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.198 PPB	RL 0.5 PPB
Chlorotoluene 4 VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.306 PPB	RL 0.5 PPB
cis 1,2 Dichloroethylene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.33 PPB	RL 0.5 PPB
Dibromochloropropane VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.18 PPB	RL 1 PPB
Dichlorodifluoromethane VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.417 PPB	RL 0.5 PPB
Dichloromethane VOCs	0.63 PPB	Federal MCL: 5 PPB	EPA 524.2 MDL 0.252 PPB	RL 0.5 PPB
Ethylene dibromide VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.33 PPB	RL 1 PPB
Hexachlorobutadiene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.466 PPB	RL 0.5 PPB
Isopropylbenzene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.269 PPB	RL 0.5 PPB
n Butylbenzene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.435 PPB	RL 0.5 PPB
n Propylbenzene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.442 PPB	RL 0.5 PPB
p Isopropyltoluene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.508 PPB	RL 0.6 PPB
sec Butylbenzene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.498 PPB	RL 0.5 PPB
Styrene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.409 PPB	RL 0.5 PPB
tert Butylbenzene VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.406 PPB	RL 0.5 PPB
Tetrachloroethylene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.205 PPB	RL 0.5 PPB
Trichloroethylene VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.204 PPB	RL 0.5 PPB
Trichlorofluoromethane VOCs	Not Detected *	No benchmark available	EPA 524.2 MDL 0.496 PPB	RL 0.5 PPB
Vinyl Chloride VOCs	Not Detected *	No evaluation possible	EPA 524.2 MDL 0.117 PPB	RL 0.5 PPB

How to Make an Emergency Toilet (A)

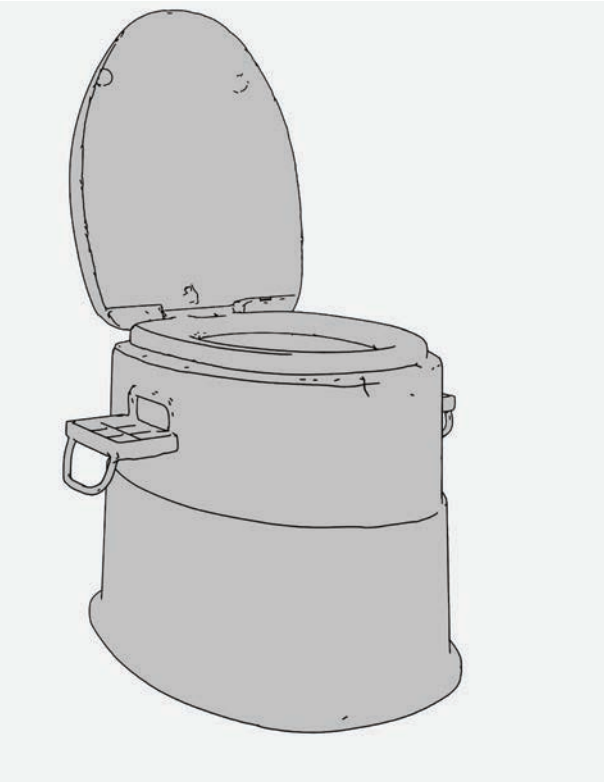
Indoor plumbing can fail for a number of reasons: disasters, droughts, or burst pipes. Many preppers and sustainability gurus have already installed composting toilets in their homes, at least in one bathroom. It makes sense. Disease from poor sanitation poses a big risk during short as well as prolonged emergencies. You need a way to deal with your waste.



Compost toilets offer the best longterm solution, but they're a commitment. Not everyone can install them in their homes. You can make something similar for a lot less money by converting emergency toilet buckets or even portable camping toilets.

Any emergency indoor toilet needs two things: A urine diverter, and cover material. These help with sanitation and decomposition.

Common cover materials include: sawdust, coconut coir, wood shavings, dry leaves, shredded cardboard, coffee grounds, pine straw, newspaper, and other "carbon" materials.



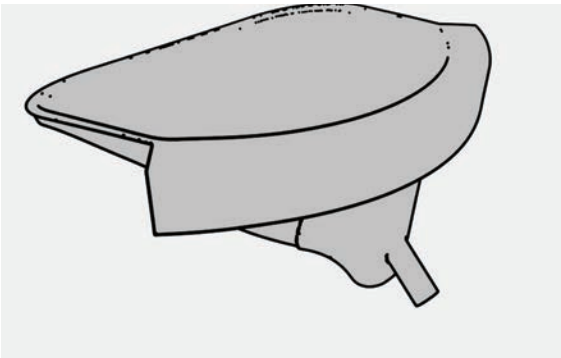
Several companies sell emergency toilets, including Reliance, who also sells Aquatainers. You can get larger portable toilets with higher seats from hardware stores for much less than it costs to install a full composting toilet. These portable toilets also fold up for easy storage.

We're going to talk about converting a bucket, but you can apply the same idea to almost anything, with a little adaptation.

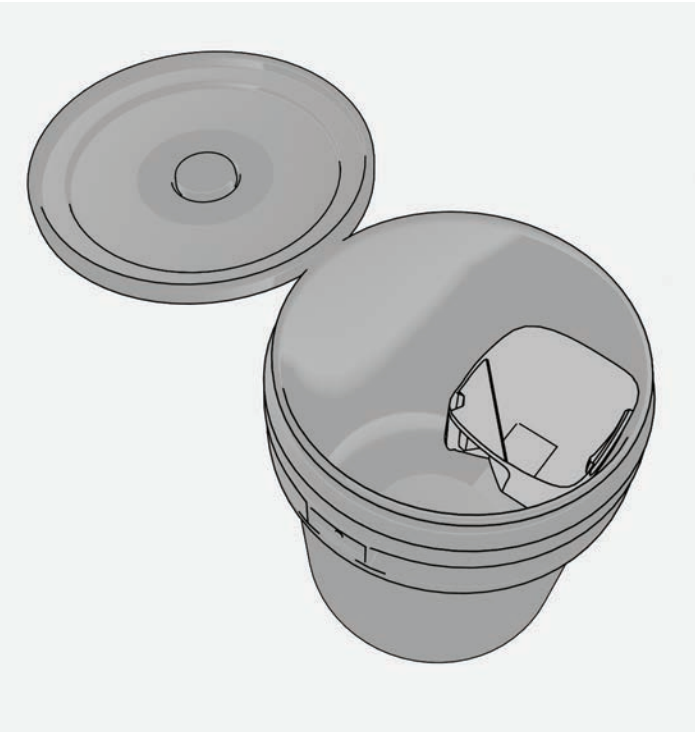
Making a Urine Diverter

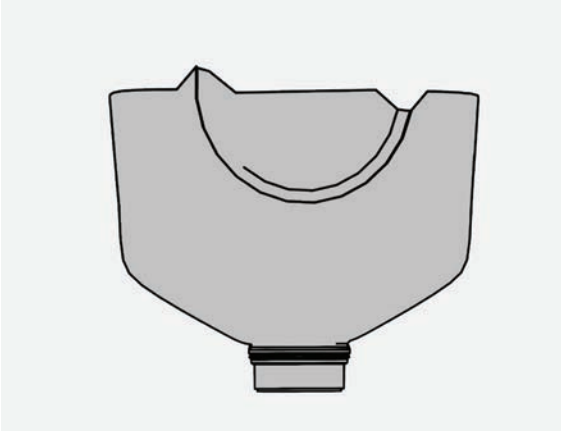
You can buy urine diverters specifically made to fit on toilet buckets, but you can also make one with almost any kind of container. Urine diverters make it possible for solid waste to dry up and start decomposing faster, and with less smell. Otherwise, you wind up with a wet mess that stinks and takes forever to dry out.





Standard urine diverters are relatively easy to get online.

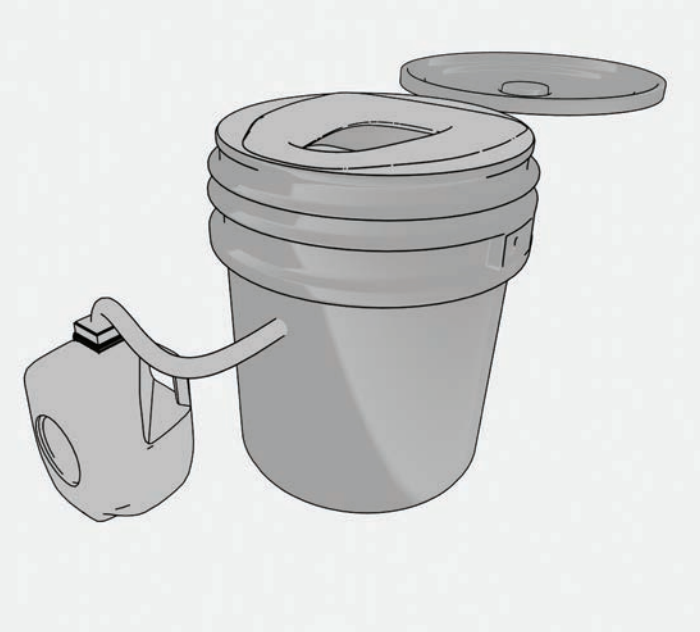




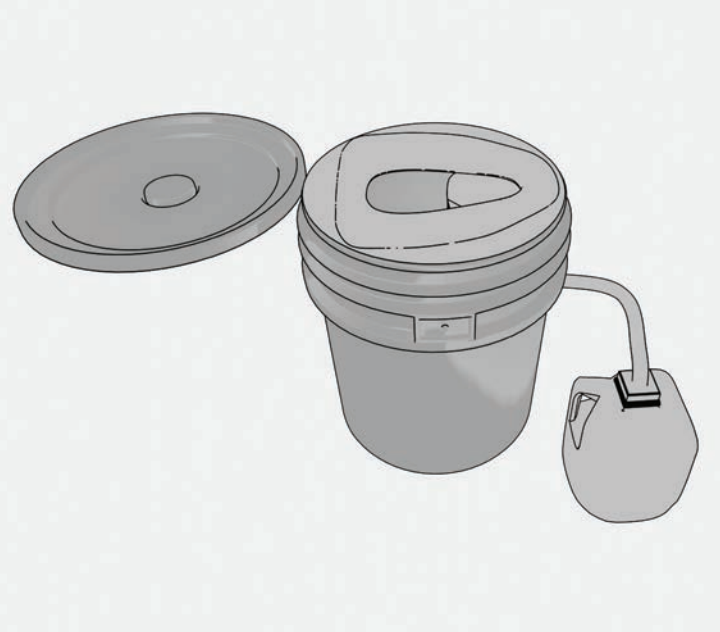
You can also simply cut a gallon jug in half. Caps run about 1-2 inches in diameter, so you can find vinyl tubing that fits the outside.

Fasten the gallon container to the top inside of the bucket with a screw.

Finishing The Urine Diverter



Drill a small hole in one side of the bucket to run the vinyl tubing through, then connect it inside another gallon container.



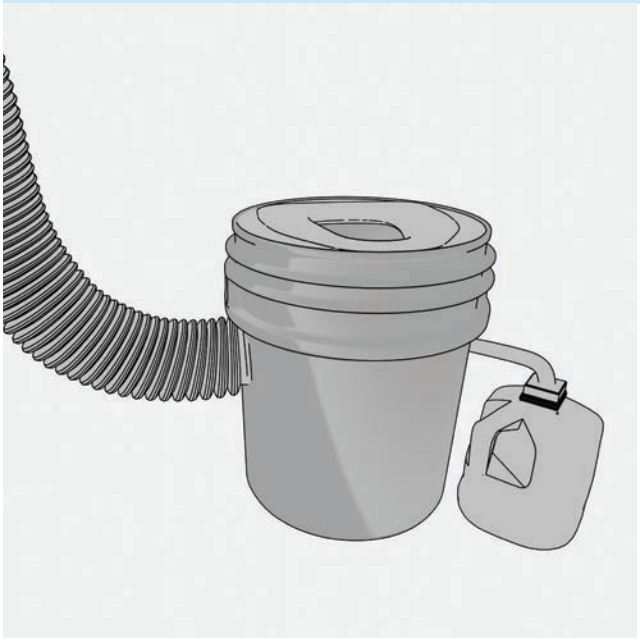
The diverter empties into the gallon, keeping liquid waste separate from solid. You're not supposed to pour any kind of waste into storm drains because they feed into rivers and streams. It's also technically illegal to bury it on your property. But during an emergency, separating them gives you more options and makes everything less hazardous.

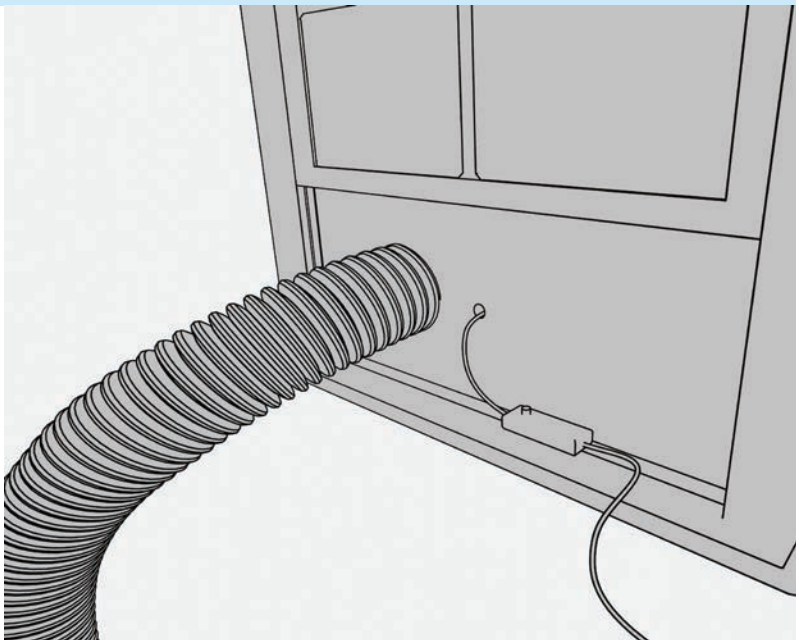


Next, you can make a vent by drilling a 3-4 inch hole in the other side of your bucket (as close to the top as possible). You could also drill a hole into the lid. Keep a spare lid just in case. Use a hole saw, and size the cut to the outer diameter of any flexible duct you can find.

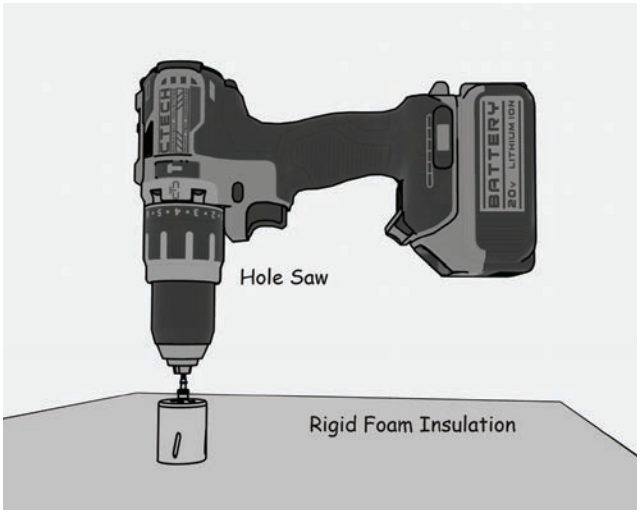


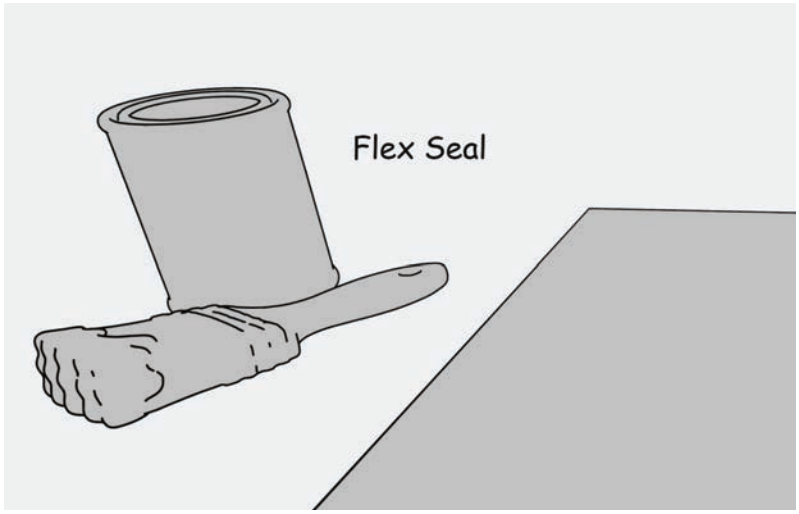
Making a Vent Port





Feed the duct into the port you drilled. Feed the other end through a passthrough panel. The section on solar panels explains how to make one of these with rigid foam insulation boards. (Drill another hole with a hole saw.) Foam insulation boards already have a degree of water-proofing, but you can coat them in Flex Seal for extra protection.

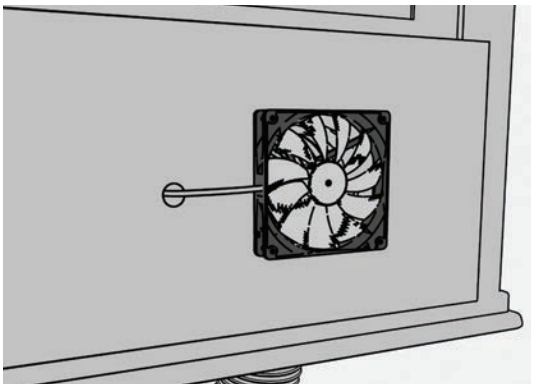




Next, you're going to mount a DC fan on the other side. It's easy to find them with AC adapters and control knobs.

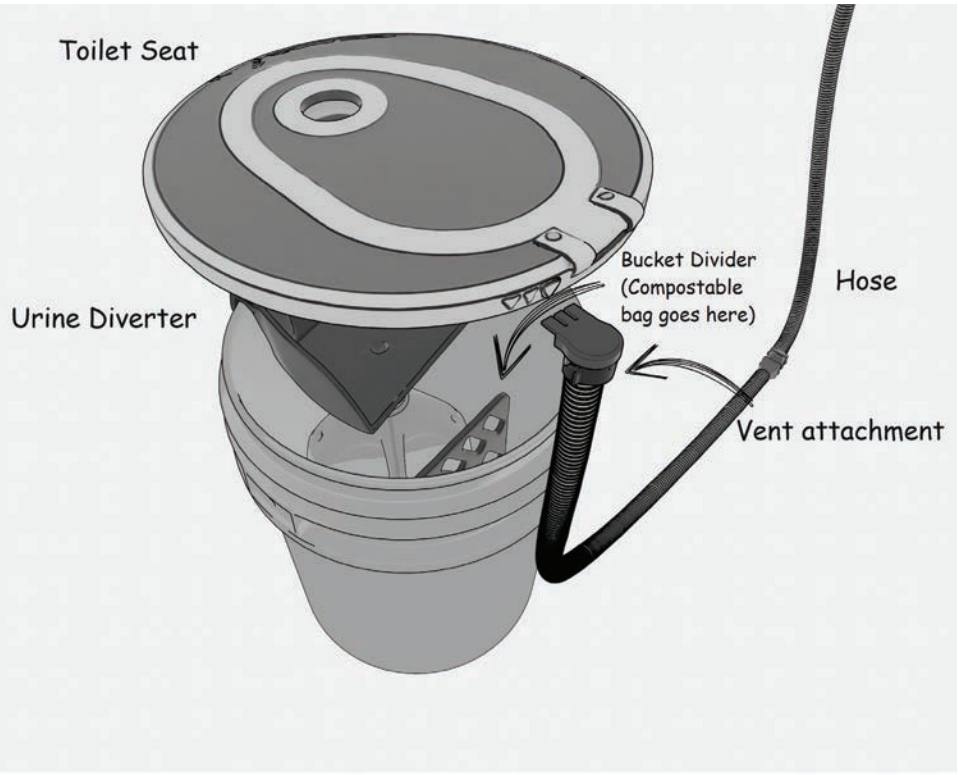
Run the DC fan cable back through the panel, so you can turn it off and on from the inside. You can also usually adjust the speed.

You'll want to run the fan for several hours a day, even 24/7 in order to dry out the solid waste. The drier, the less smell.



How to Make an Emergency Toilet (B)

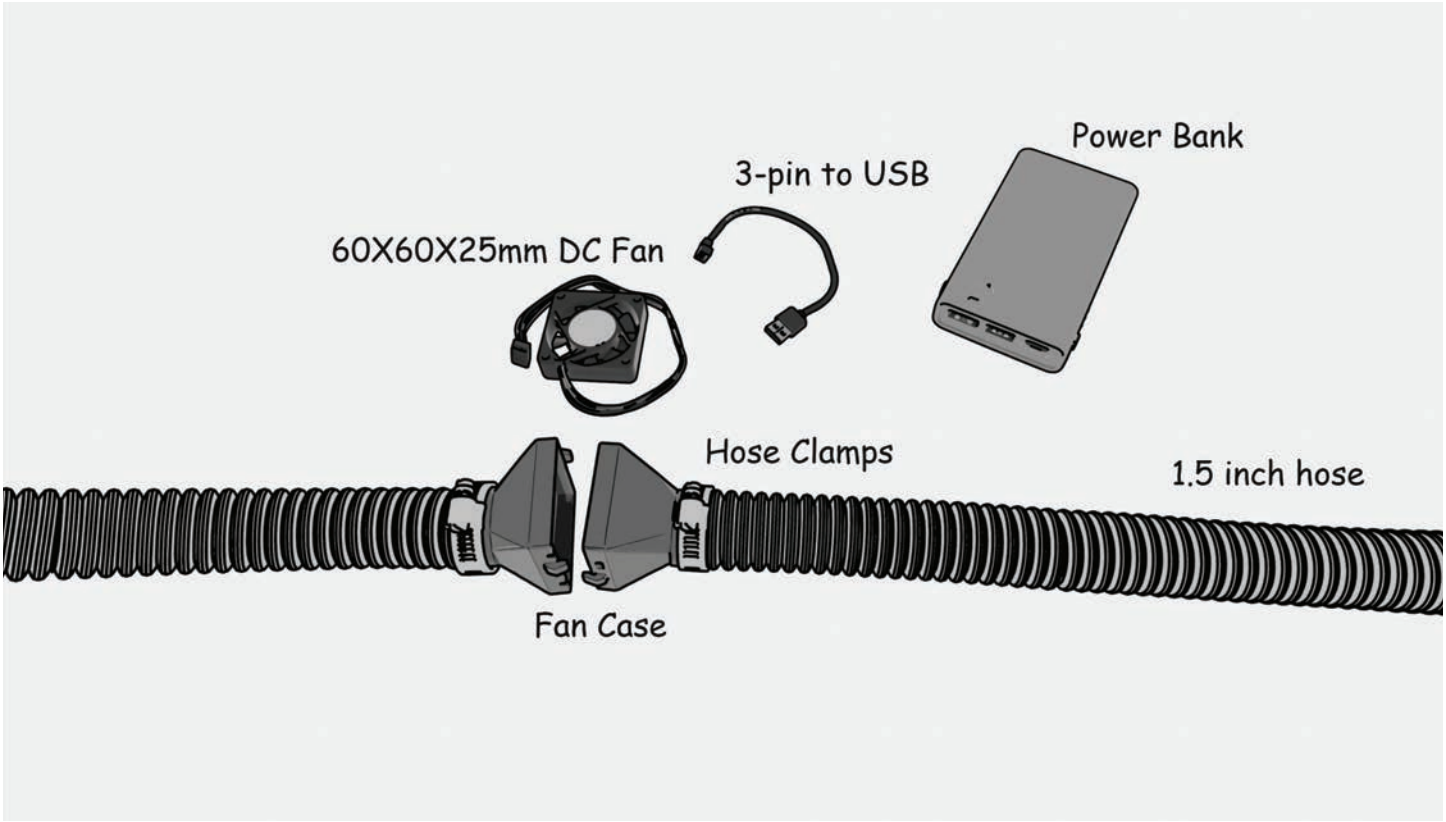
If you want an even better setup for an emergency toilet, you can modify kits from Johnny Compost. This guide takes their basic Netty-Go model and blends it with the setup shown earlier. This setup offers a few upgrades for a longterm situation.



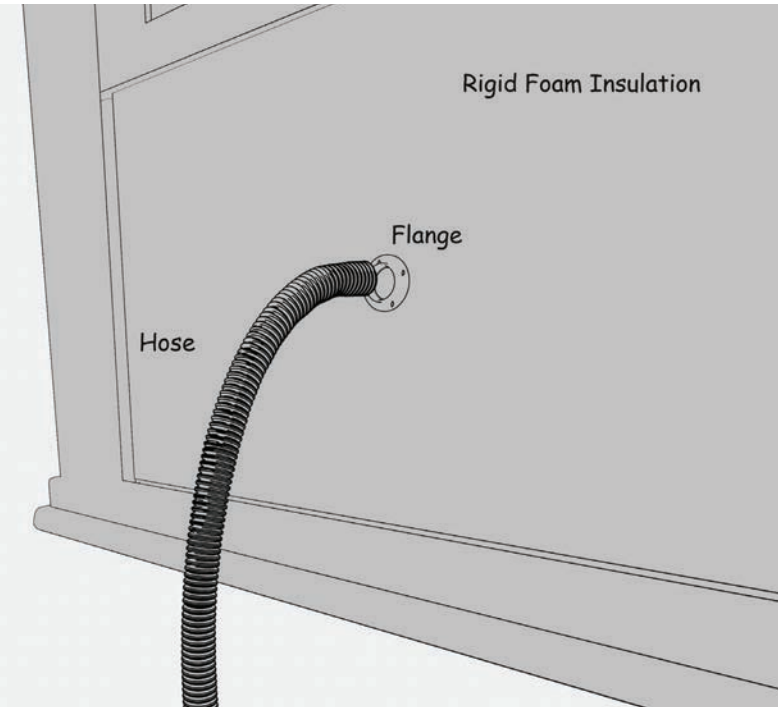
These toilets come with all the parts you need except three things: You'll need a 5-gallon bucket and a 1-gallon jug. You'll also need some plastic bags.

You can run their hose through a panel just like set-up A. Their hoses come with a flange that you can also mount to the panel to make venting easier.

These kits also come with fans and fan case/housings so you can use them inline with the hose. The fans really help dry out the solid waste and manage odors. Get some hose clamps that fit a 1.5 inch hose to give them a stronger hold.



How to Make an Emergency Toilet (B)



You can mount the flange from the Nettyo kit onto the foam insulation with screws. Just do it manually and slowly (no power tools) so it secures.

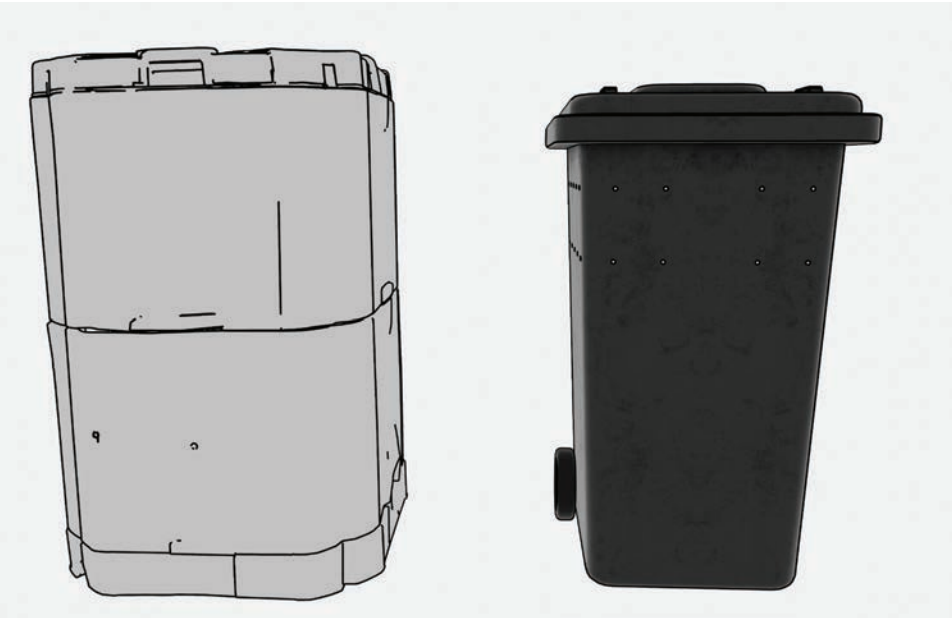
In both the A and B setups, you'll add sawdust or woodchips to your solid waste every time you go. The fan runs 24/7 to help dry out the waste. As it dries, it's going to shrink by roughly 90 percent.

When it's full, you take it outside to your hot compost pile. We're going to talk about setting that up next, because it's crucial. You can't just mix it in with a normal pile.

Humanure undergoes a specific process with thermophilic bacteria.

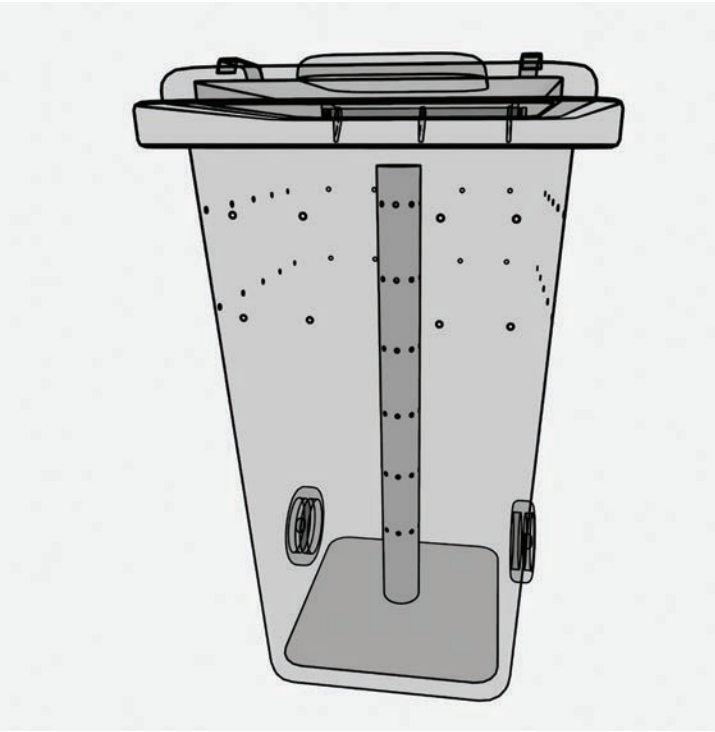
Hot Composting The Waste

Thermophilic (heat-generating) microbes break down your waste for free. Once you fill up a bin, the compost "matures" for a full year. The microbes will destroy any pathogens as long as the temperature stays between 130-160F (54-71C). The best way is to continue adding material to the pile and to keep it damp, but not soggy. You can use a compost thermometer to maintain the temperature. The microbes might go dormant during winter but will pick back up in the spring.



A hot compost pile needs to be at least 3x3x3 ft or about 1 cubic meter to achieve the right temperature. It's tempting to follow the advice of homesteaders and just nail together some pallets, but that won't work in a suburban neighborhood where leachate can easily contaminate the ground in smaller yards and cause major problems with your neighbors. So, you have two choices: You can spend hundreds of dollars on an Aerobin (left). It will keep your compost sealed and insulated. Or you can modify a 95-gallon trash bin. It won't work quite as well, but it will do the job. It will blend into a suburban landscape much better than a wall of pallets. A family of three would fill either one up in about 7-8 months. You might need two or three.

Modifying a Trash Container



It's not that hard to modify a large trash bin. First, drill 1/2 inch holes on all sides. Make two rows, with about 10 holes per side. Start at least 2-3 inches from the top.

Don't drill any holes in the bottom foot of the bin. You're going to fill the first 8 inches with wood chips for a base layer.

You're going to make an air funnel with PVC pipe. Get one 3-4 inches in diameter. Drill 1/2 inch holes every 3-4 inches. Likewise, leave the bottom 8-12 inches clean. No drilling. Cut the pipe with a hacksaw to leave at least 6-8 inches of space from the lid. Set the pipe in the bottom of the container and then fill the wood chips around it. The pipe will stand on its own, delivering air to your compost.

Some Rules of Hot Composting

1. Don't compost the bags. Those "composting bags" are a scam. They won't break down within a year. They'll choke the decomposition process. You'll want to use a plastic bag of some kind (probably 13-gallon size) to manage the waste in your bucket. But you're going to need to empty it manually into your hot compost bin. This process won't get too messy as long as you're separating the liquids from the solids, using enough carbon material (chips, sawdust), and running the fan.

2. Maintain a ratio of 3 parts carbon (wood chips, sawdust, etc) to nitrogen (solid human waste, kitchen scraps, etc).

3. You don't need to turn the piles if you're adding an air pipe. Aerobins also come with an air pipe you install.

4. Check your temperatures at least a few times a week with a compost thermometer. Measure near the center, a few inches away from the air pipe, for 2 minutes.

5. If your temperature drops below 120F (49C), add some water, some more waste or greens, or some urine. In fact, a little urine is one of the best ways to supply moisture as well as nitrogen to the pile. Keep them separate during the drying process, but adding some back in later helps.

6. You don't need compost "starters" or "accelerators." Your solid waste, wood chips, and other material contain enough microbes to start the process just fine. Even a scoop of dirt can be enough.

7. Cover every addition to your pile with 1-2 inches of wood chips or saw dust. Chips work fine for drying, but sawdust stands out as the best for covering.

8. Keep separate, "compost only" tools and gloves. Wash and disinfect your hands immediately after handling your compost pile to avoid cross-contamination.

9. The 12 months for maturing is mandatory.

Best Cover Materials

Sawdust
Cardboard and newspaper shavings
Coco Coir
Peat Moss
Aspen Bedding
Pelletized Bedding
Chopped Straw
Hemp pellets or shavings

Note: For a DIY trash composting bin, avoid chopped straw and big wood chips. Stick to sawdust and similar fine covers.

What About The Pee?

1. The foolproof method: Dig a deep pit 18 inches in diameter and 3-4 ft (1-2 meters) deep, or as deep as you can. Pour the urine into the pit. Cover it with soil and other carbon immediately. Keep doing that until the pit tops off, anywhere from 3-7 months, depending on how many people are using it. Once you fill it, leave it for about a year. Soil microbes will process the urine. Rain will dilute the salts. You can rotate 2-3 pits like this for years.

2. Dilute it and use for gardening. Keep a 10:1 ratio of water to urine. This comes with a little risk, so only try it if you're sure you know what you're doing.

3. Use it to feed your compost. Mixing solid and liquid waste creates toxic sewage in the early stages. Once you have dry solid waste safely moved to a composting bin and mixed with enough carbon, urine becomes a helpful way to add moisture and nitrogen back when needed.

4. As an absolute last resort during an extreme, long term emergency, you can pour some urine into storm drains. However, this idea will quickly backfire if several homes try to do the same thing at the same time. It doesn't immediately wash out to water sources. It will sit, creating an awful ammonia stench and attracting lots of unpleasant pests.

Definitely Do Not:

1. Definitely do not use grass clippings for cover material. Also don't use chunky wood bark or chips, especially not cedar or redwood. It takes too long to break down.

2. Don't use your hot compost for growing food unless it's a last resort and you know what you're doing. Many cities and counties make it illegal.

3. Do not pour urine down storm drains as a first resort or a go-to solution. This creates an extreme sanitary hazard, almost immediately. It doesn't scale at all.

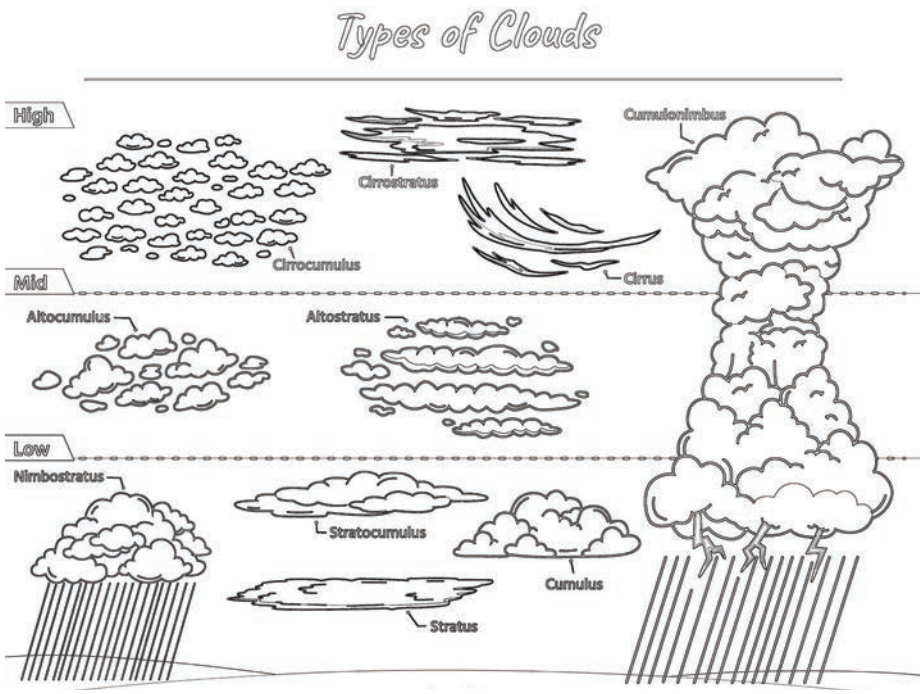
4. Do not try to drink it. You can't survive on urine. It's a survival myth.

5. Do not try to filter it. You'll ruin your filters. Urine is widely considered "sterile," but that's another myth. It contains dissolved solids that will clog anything but heavy, industrial filtration systems at full treatment plants.

6. Do not try to let it evaporate. It will create an unbearable stench while attracting all kinds of pests. This is one of the worst ideas.



Reading The Weather



You won't always have a weather app to predict danger. That means relying on older forms of knowledge. First, clouds:

Cirrus: Fair Weather
Cumulus: Sunny Weather
Cirrostratus: Rain/Snow
Altostratus: Rain/Snow
Altocumulus: Afternoon Storms
Stratus: Light Rain
Nimbostratus: Steady Rain/Snow
Cumulonimbus: Strong Storms

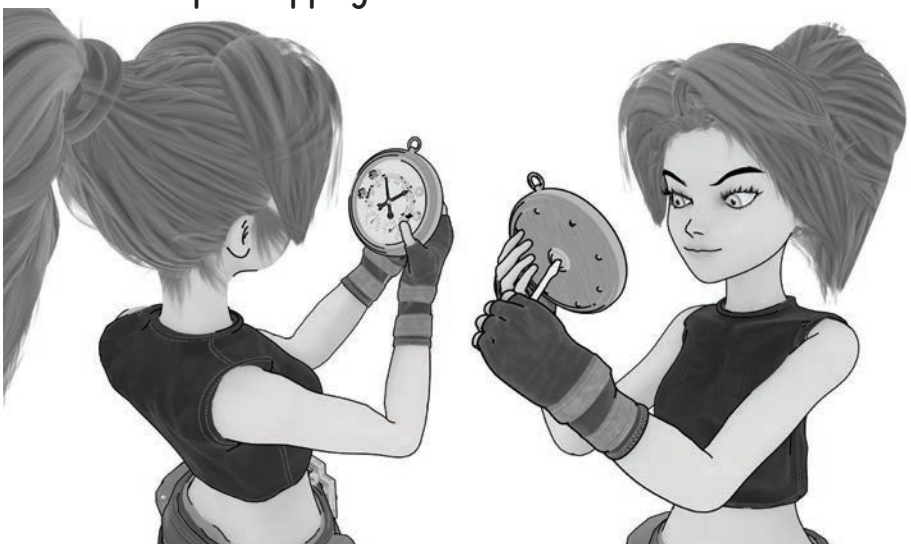
Shelf or wall clouds indicate storm systems that can produce a tornado. They also have tail clouds, called inflow bands.

Barometers drop when the pressure does. A falling barometer indicates a higher chance for rain and storms. The faster a barometer drops, the better the chances for severe weather. A pressure reading that falls below 1009 mb indicates a stronger chance of rain and storms.



If the barometer drops 4 mb or more over the course of three hours, that increases the chances even more. You can be pretty sure of a major storm if:

Your barometer falls 8 mb or more over 12 hours.
Your barometer drops below 1009 mb.
It heads to 1005 mb or below.
It keeps dropping.



Adjust a new barometer to your local barometric pressure by checking local forecasts (while you can). Most analog barometers have a screw on the back. You simply turn the screw to match the local reading.

The front of the barometer has a secondary hand with a manual dial. You twist this to the daily reading, so you can measure change from one day to the next.

Winter Storm Survival



Extreme cold already leads to tens of thousands of excess deaths a year. When an extreme storm hits an unprepared area, hundreds can die simply because they don't have the knowledge or tools to stay warm when the power goes out. You don't need a fortune in gear, just some basic information. Don't wait for the storm to hit. Set up a micro-zone before you lose power. It puts you in the best possible situation to endure.

Make a Micro-Zone

Choose one room to keep warm. It maximizes everything.

Seal The Perimeter

Stuff blankets and towels into cracks around doors and windows.

Pitch a Tent

It works with your body heat to keep you 10-20F degrees warmer.

Save The Heater

Heat escapes fastest right after the power goes out. Wait for temperatures to equalize in the mid 50s F. It's more efficient.

Hand Warmers

They don't need electricity.

Heated Vests

They use battery packs.

Electric Blankets

Modern electric blankets are roughly 15-20 times safer and more efficient than space heaters.

Emergency bags aren't just for bugging out. You'll reach for it during any kind of power outage. That's where you keep flashlights, portable power stations, and other equipment to help you stay safe.

A power outage doesn't have to feel like a disaster. If you prepare for it beforehand, you can pass the time with company. Just stay updated by checking in with local weather. Save your phone's battery for essential communication and news. Text friends and family in the area to make sure they're okay. If it's safe to leave your home, you can also check on neighbors and other vulnerable members of your community to see if they need anything. You can even bring them to your place, if it feels appropriate.



Cold Weather Gear: Quick Guide

Layers

Base Layer: Thermal underwear made of polyester, polypropylene, or Polartec.

Mid Layer: A jacket or sweater made of merino wool, fleece, down, etc.

Shell: Hard shells provide the best protection, but they're bulky and not comfortable. Soft shells also offer good protection and comfort.

Beanies, Balaclavas, Gloves, Convertible Mittens, Socks: Made from wool, Polartec, etc.

Wind Rating

Any good outer shell should provide a wind rating, measured in cubic feet per minute (CFM). It describes how much of a 30 mph gust can pass through one square foot of material. The lower the CFM, the better. Here's a breakdown:

CFM 60 or above: Poor wind protection

CFM 20: Some wind protection

CFM 5-10: Good protection

Waterproof Rating

Outdoor gearists measure waterproofing in mm with the hydrostatic head (HH) test. It describes how many millimeters of water can sit on the material before it penetrates. A 5,000 mm rating offers the minimum. It holds up against light rain and snow.

5,000 mm: Minimal water protection

10,000 mm: Some water protection

15-20,000 mm: Good protection

Staying Warm without Power

* Keep a tent handy or make one with blankets to conserve heat
* Keep sleeping bags on hand rated for cold temperatures
* Use candles, tea candles, and tea candle stoves for cooking and heat
* Solar power for heaters is an option, but they use a lot of energy
* Sharing body heat with other people or pets can save your life
* Be careful with candles and heaters, especially when sleeping. You might even want to turn them off and rely on sleeping bags, body heat, hand warmers, etc.
* Keep foods on hand that don't require much preparation
* Wool or polyester base layers, gloves, socks, hats, beanies, and neck gaiters

Heatwave Survival

Heatwaves threaten hundreds of millions around the world now. You can dramatically increase your odds of survival without having to rely on central air conditioning.



A Cool Bath

One of the best things you can do if you're experiencing heat stress is take a bath. Water from plumbing stays a consistent 50-70F (10-21C) degrees, much cooler than summer air. Cold water immersion is a proven emergency medical strategy that has saved countless lives during heatwaves.

A Chest Freezer

Don't try to keep central AC going during a power outage or a strained grid unless you have a serious backup. Instead, use the electricity you've got to run a chest freezer. They're much more efficient. Use it to store cold water, and use the water for drinking or emergency cooling.

Make a Zeer

You can keep food and other items cool without electricity by making a zeer. Put a smaller, unglazed clay pot inside a larger one. Tape any holes shut. Fill the space with moist sand. Keep watering the sand, and the inside temperature of the smaller pot will remain considerably cooler than the outside temperature.

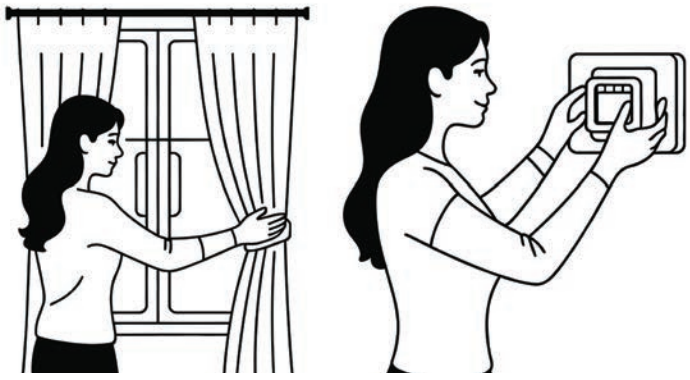


Ice Sheet Cooling (ISC)

You can also deploy ice sheeting cooling (ISC), another strategy used by EMS and military personnel. Soak bedsheets or towels in cool or cold water, and wrap yourself up in them.

Close The Curtains; Kill The Electronics

Get blackout curtains if you can (but not black curtains). They can reduce heat gain by 25-33 percent. Keep them closed during the day. Unplug electronics you're not using. A high-end PC workstation can add as much heat to a room as a 1,500 W space heater. An oven can add twice that much. During a heatwave, avoid them all.

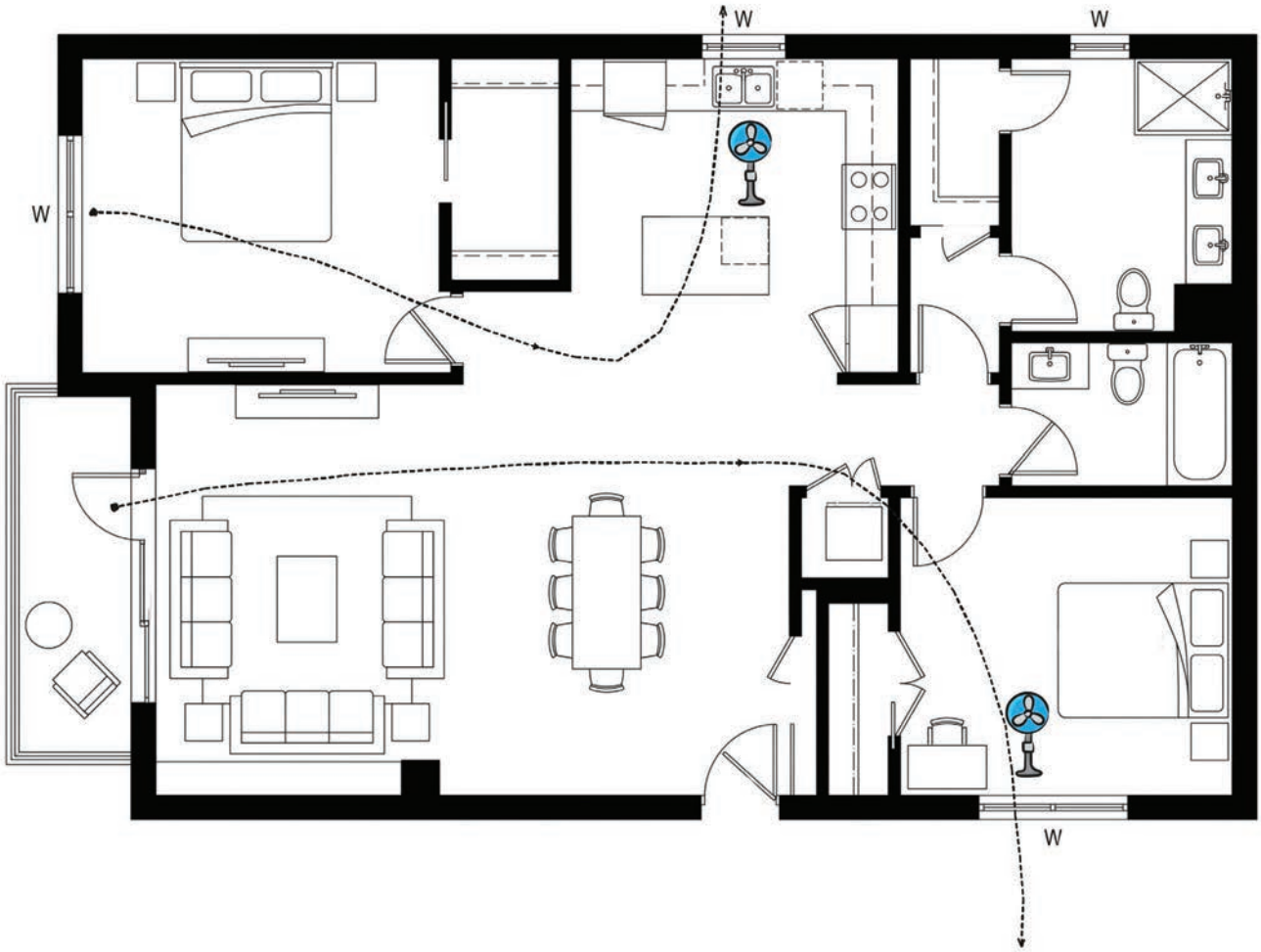


Using Fans to Vent a Home

Vent your living space to flush out heat, especially at night when the temperature drops. You want to create a cross-breeze from one end of your house to the other. If you only have one or two fans, place them at the exhaust ends. They'll maximize the amount of heat you pull through your home and out. If you have more, add fans to the intake windows. It's surprisingly effective.

Most people put box fans right into their windows. If you can place the fans 2-3 feet away from open windows. It takes advantage of the "Bernoulli" Effect, pulling and pushing larger volumes of air.

Cool the house through ventilation at night and early morning. Close the windows before the temperatures start rising again. Keep your house closed until night.



A List of Heatwave Don'ts

*Don't run window fans when it's hotter outside than inside. It simply heats your space.

*Don't wedge box fans into window frames. Place them 2-3 feet back.

*Don't hang dark curtains without a reflecting backing. They'll absorb heat and radiate it.

*Don't cover HVAC vents. It will create unstable duct pressure and tax your AC.

*Don't overuse your AC. Setting the temperature lower will risk freezing your coils.

*Don't run heavy appliances during the day if you can possibly avoid it.

*Don't use a fan if the indoor temperature exceeds 95F (35C). It will dehydrate you.

How to Survive a Heatwave

Keep Rooms Cool

- Lower shades to reduce heat
- Maintain cross air ventilation
- Avoid fans if room is >95 degrees as they no longer cool the air

Wear Loose Clothing and a Hat

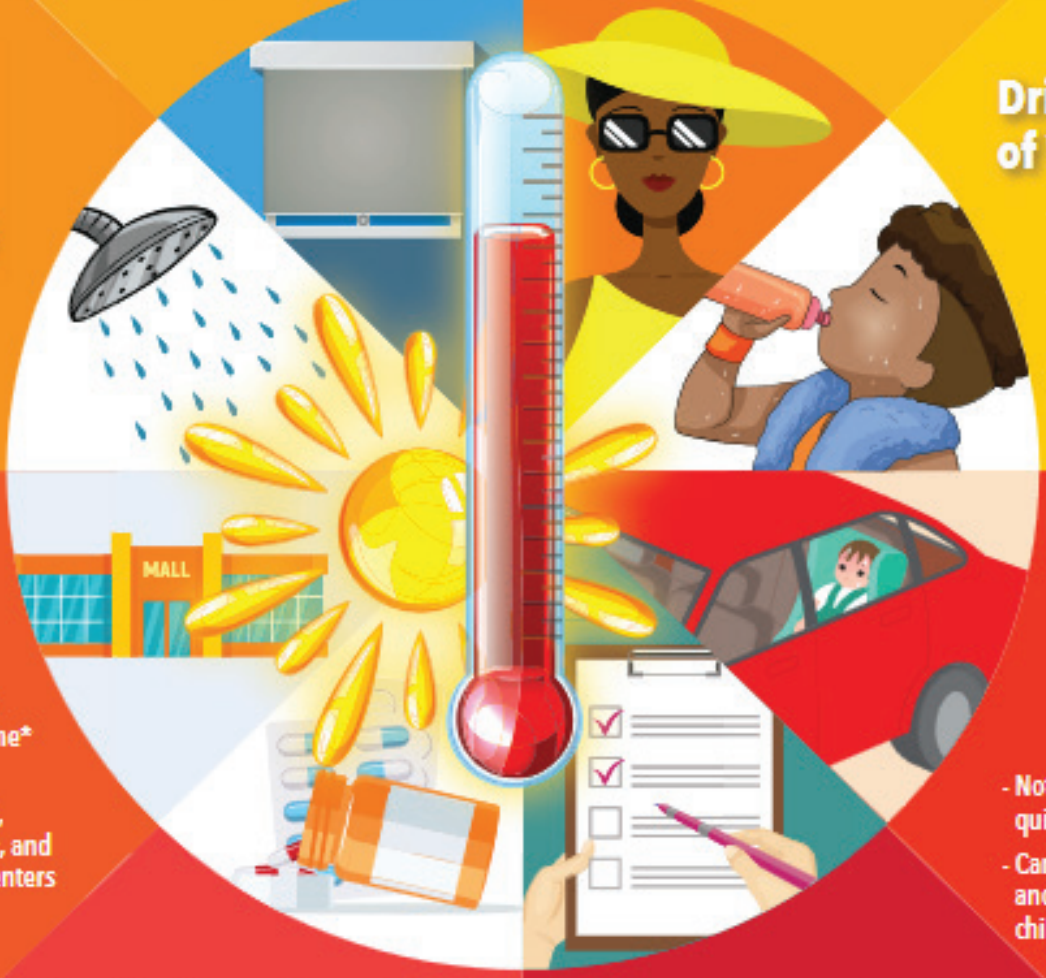
- Loose cotton (non-synthetic) is best
- Wear a wide-brimmed hat outside

Cool Down with Showers

- Or cool, wet towels

Drink Lots of Water

- Hydrate before you feel thirsty
- Avoid alcohol, caffeine, and sugary drinks



Find Cool Shelter

- Don't wait out the heat at home*
- Cool down in libraries, malls, movie theaters, and local cooling centers

Never Leave Kids or Pets in Cars

- Not even for a quick minute
- Cars heat up fast and can kill children and pets

Take Meds as Prescribed

- BEFORE heat waves, ask your health care provider about any changes to your medications during hot weather

Make a Plan for Help

- BEFORE heat strikes, ask a friend/neighbor to check on you 2x/day
- Seek health care IF throbbing headache, dizziness, nausea, or feel confused
- Call 911 for emergencies

*Many heat-related deaths happen by waiting out heat waves in overheated apartments.

SIGNS AND SYMPTOMS OF HEAT STROKE

Heat stroke is serious but preventable. Watch for early signs to prevent dangerous impacts.



Early Signs
increased sweating, muscle cramps



Heat Exhaustion
heavy sweating, thirst, fatigue, decreased urine, headache, nausea or vomiting, cold, clammy skin, dizziness or fainting



Heat Stroke/SEVERE
throbbing headache, fast strong pulse, hot flushed dry skin (skin may be damp), confusion and loss of consciousness (passing out)

SIGNS/RISKS ARE DIFFERENT FOR DIFFERENT PEOPLE



Young Children: whimpering, crying, cranky, listless. Infants and young children can easily become dehydrated



Young Athletes: can be reluctant to inform coaches of trouble and push beyond safe levels; should not participate in strenuous athletic activities during extreme heat



Older Children and Teens: angry, aggressive, trouble concentrating

Older Adults: confusion and more extreme lethargy



Frail and Chronically Ill: Cooling mechanism of sweating less effective, medications and illness make risks more significant



Pregnant Women: Risk of pregnancy complications as body heat increases due to additional fluid and weight



Low Income: Substandard housing, lack of air conditioning



Outdoor Workers: Greater exposure to heat, pressure to continue to work in extreme heat



Homeless: Greater exposure to heat and lack of ability to find protections; homeless mentally ill at even greater risk

People with mental illness or substance abuse: May have difficulty monitoring and caring for themselves

ICE-SHEET COOLING

WHEC
WARRIOR HEAT- AND EXERTION-RELATED EVENTS COLLABORATIVE

Ice sheets can help reduce core temperature in Service Members showing symptoms of **exertional heat-related illness**.

HOW?

They can **quickly and efficiently** help cool the patient at a rate of **~0.16°F PER MINUTE**

PREP

1. Fill ice chest with **1/3 COOL WATER** and **2/3 ICE**



2. **Immerse bedsheet in ice water.**
   Use **5 sheets** per anticipated heat casualty.

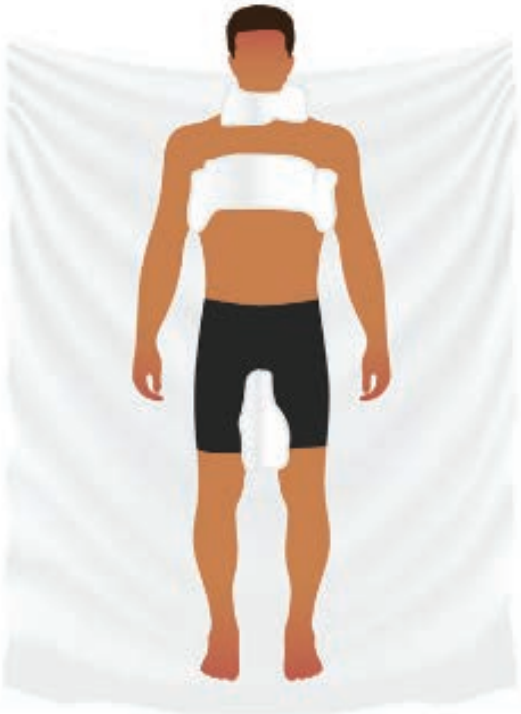
TIP

If sheets aren't readily available, use a shirt, blanket, or any form of cloth that can be repeatedly dipped in ice water and placed on the casualty.

Depending on the risk assessment, maintain ice sheets at each training site, on an evacuation vehicle, or at your military treatment facility.

USE

- Remove casualty's clothing down to undergarments.
- Lay ice sheet down on litter or stretcher.
- Place casualty on top of ice sheet.
- Put wadded or rolled ice sheets on the patient's **groin**, (under) **armpits** and (around) the **neck**.
- Drape an extra ice sheet over the top of the torso and legs.
- Rewet sheets every **3 minutes**.
- Continue cooling (even if casualty is shivering) until EMS arrives.



USU Uniformed Services University | CHAMP Consortium for Health and Military Performance

Beefing Up Your Security



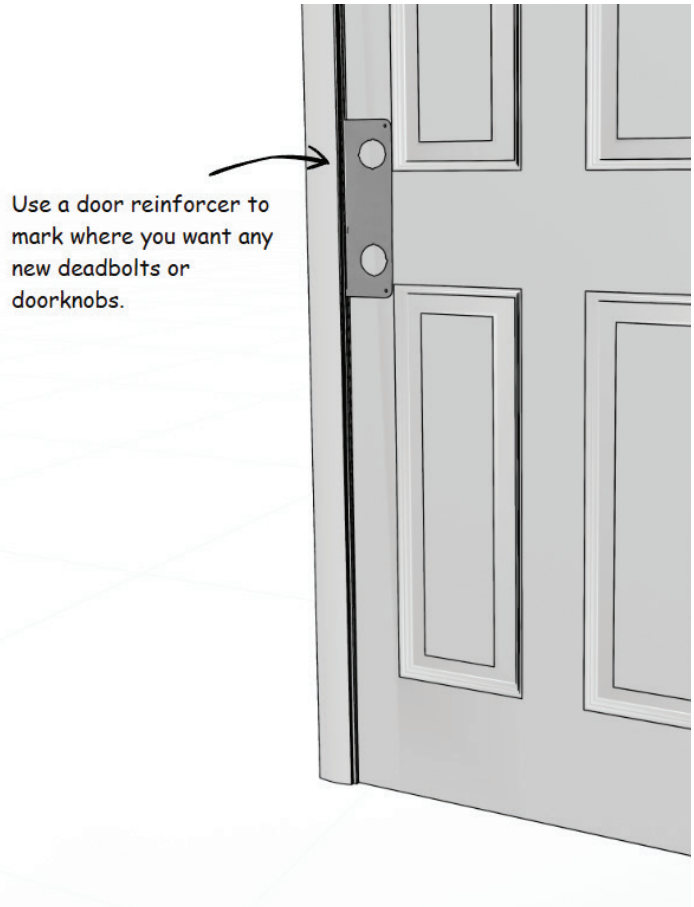
Longterm emergencies and grid failures bring a variety of threats. You'll face intense storms as well as intruders. Without spending a fortune, you can strengthen your doors and windows in ways that take care of 90 percent of these threats.

You can replace your flimsy 3/4 inch screws at the strike plates and hinges with #8 3-inch wood screws. This alone makes doors much harder to blow or kick in.

Next, you can add combo strike plates and door reinforcers. You can also upgrade your deadbolts and doorknobs to resist sawing and prying attacks. These steps make a door nearly impossible for a human to kick in. It even poses difficulty for battering rams and hammers.

Finally, adding other barriers like Dooricade or Nightlock will give even more strength.

If you want to add deadbolts or other hardware, start with a door reinforcer. It acts as a template for marking the locations precisely. You can also get door marking kits with a range of different door hardware sets. You can find them online as well.

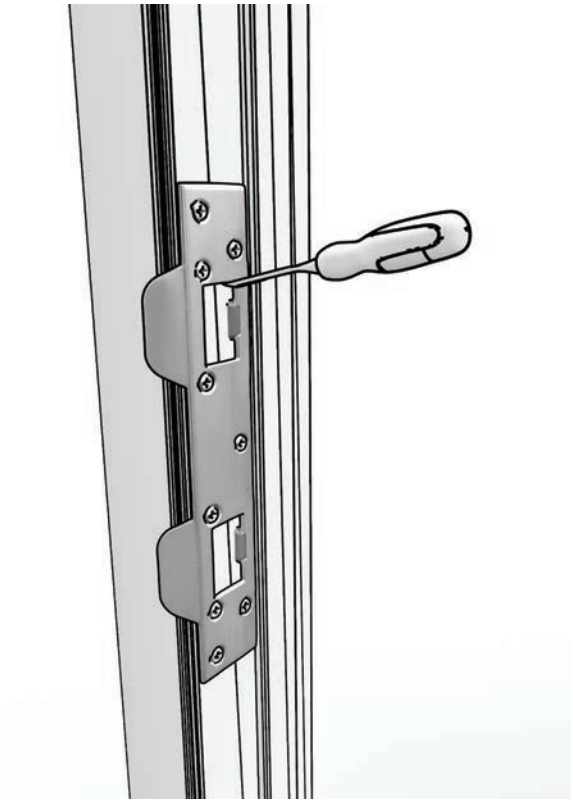


Use a door reinforcer to mark where you want any new deadbolts or doorknobs.

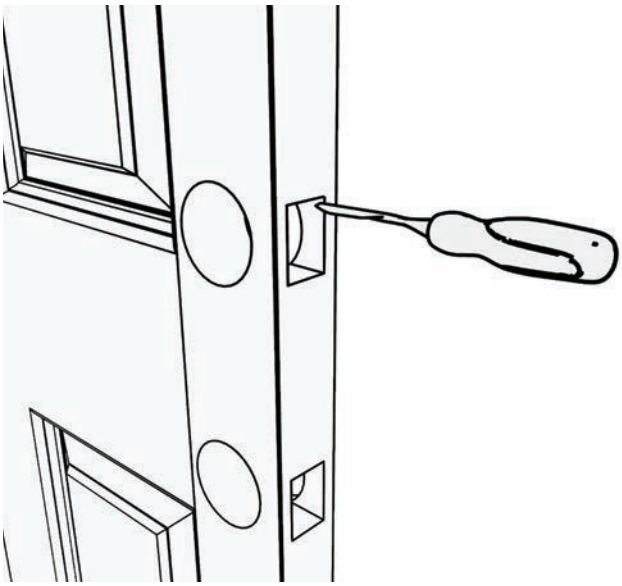


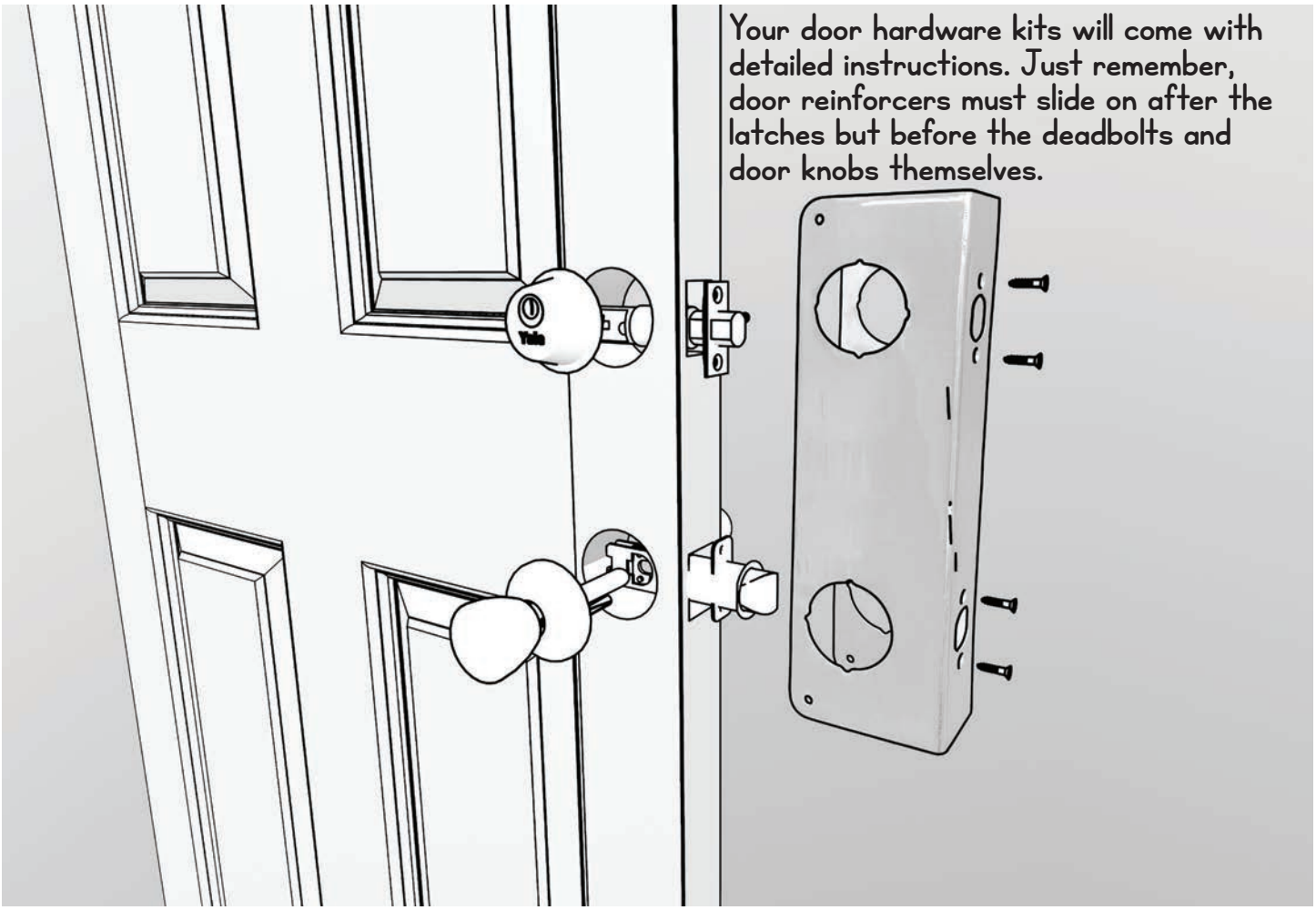
Use a hole saw with tungsten carbide teeth to cut through metal doors.

Installing Door Hardware



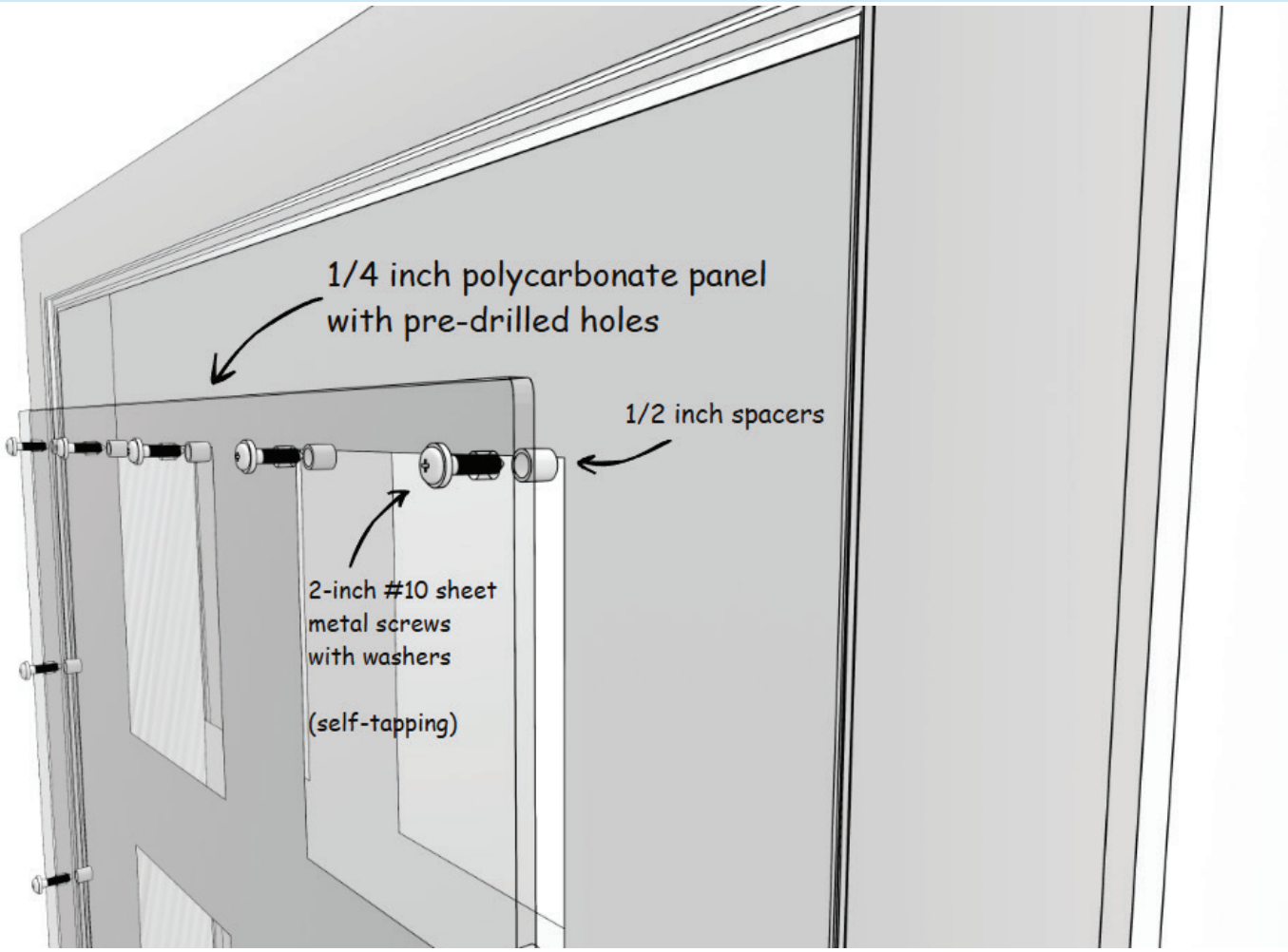
If you're replacing hardware or installing it new, you might need to chisel the jamb or the door. Use the hardware itself (door reinforcers and strike plates) to mark out where you're going to chisel. Use a mallet instead of a hammer.





Your door hardware kits will come with detailed instructions. Just remember, door reinforcers must slide on after the latches but before the deadbolts and door knobs themselves.

Protecting Glass



You can protect glass in doors and windows without having to pay premiums for storm-rated materials. The simplest way: polycarbonate panels. At 1/4 inch, polycarbonate is 200 times stronger than glass. It flexes under impact, handling intruders as well as debris from intense winds. You can order these panels from a range of companies. Some of them will even pre-drill holes for easier installation.

You just need to measure the space you're covering and add 1.5-2 inches perimeter for the pre-drilled holes. Keep the holes at least 1/2 inch from the edges.

Install the panels with 2-inch sheet metal screws. Self-tapping screws can reduce the need for pilot holes, but many experts still recommend them. Use 1/2 inch nylon spacers if you need to install the panels over moulding.

The company will need detailed information about the number of pre-drilled holes and placement. Aim for a pre-drilled hole every 5 inches to avoid crowding.

For #10 screws, you'll want 5/16 inch holes to give the panel some breathing room. The slightly oversized holes will allow the polycarbonate to expand and contract during temperature changes without cracking.

Choose screws with washers already attached. The washers ensure the screws don't rip out during forceful impacts.

Install the panels on the inside of doors and windows whenever possible. Doing so protects them from the elements. It also keeps intruders from simply unscrewing the panels. Even installed on the inside, the panels will make it almost impossible to break through.

What Else You Can Do

1. Replace garage doors with ones rated for wind-load. Most garage door companies carry stronger steel doors with reinforcement bars for affordable prices. Garages often become a key point of failure during intense storms and tornadoes. The garage door blows in, then wind can sweep in and compromise the rest of the house.

2. You can replace vinyl siding with Everlast to increase a home's resistance to storms and fires. This siding can withstand winds up to 130 mph and beyond. It's also extremely heat resistant, compared to vinyl that starts to warp above 100F degrees.

3. Install Simpson strong ties or hurricane ties to your roof rafters. They add stronger connections between the roof and wall studs. This step helps stabilize a house from high winds and air pressure during tornadoes.

4. For intruders, keep pepper spray or bear spray on hand. Combined with door reinforcements, they provide a powerful deterrent.

5. Plant pyracantha (firethorn) or other thorny bushes along fences, under windows, and around doorways to make crossing your property dangerous.

6. Weapons: Tire thumpers. Batons. Stun guns. Tasers. You can also fill pump shotguns with less lethal ammunition like rubber buckshot and beanbag rounds.

Make Your Own Pepper Spray

Yes, it can be dangerous to make your own pepper spray. On the other hand, you might not have a choice.

1. Add two tablespoons of ground chile pepper to a measuring cup. You could use anything from cayenne to Carolina Reaper.

2. Saturate the ground pepper in rubbing alcohol while stirring. It should have the consistency of hot sauce.

3. Add one tablespoon of vegetable oil and keep stirring.

4. You can add soap or other ingredients if you want, but the peppers should be enough. Don't overthink it.

5. Cover it and let sit overnight.

6. Run the liquid through cheesecloth or a coffee filter to strain it.

7. Warning: These homemade recipes will generally last a few weeks before they start to break down.

8. Some tutorials offer detailed guidelines on injecting the mix into pressurized canisters. This introduces a lot of risk.

9. Instead, try a heavy-duty, industrial chemical spray bottle. Sometimes they're called "chemical resistant sprayers." These work much better than standard spray bottles. Those will clog.

10. Think about upgrading to a 1-gallon compression garden pump sprayer, like the kind used to spread liquid fertilizer and pesticide. They come with a wand. These give you more control and more distance.

Communication: Resilience

Special Contributor:



I WAS NEVER HERE

AUG 26, 2026

During an emergency, you'll want to communicate with your family if you get separated. You'll also want to communicate with other groups and even emergency workers when cell phone towers are down. Here are your options:

Satellite Phones



These days, you can buy a dedicated phone or a satellite transceiver that pairs with your cellphone. Satellite phones have shrunk considerably in size from the huge, clunky things of yesterday and now are no bigger than a cordless phone.

FRS Radio



FRS stands for "Family Radio Service;" it's your basic walkie-talkie. You can buy them at Walmart or Amazon. They're cheap, but they only work for short distances. Don't listen to marketing hype. Average range is 1-2 miles.

CB Radio



These radios have a wide user base that includes truckers, clubs, and other groups. They're still relatively limited in range, between 7 and 20 miles max.

Satellite Messengers



Satellite messengers are small, dedicated texting devices that connect to satellites for communications out of reach of cell networks. Garmin appears to be the "gold standard" and uses the Iridium network.

MeshCore & Meshtastic



MeshCore and Meshtastic are both new approaches to off-grid communications with a focus on decentralization and encryption. Multi-hop repeater routing can let you send messages up to 100 miles away. A typical setup includes a low cost transceiver paired with your phone via software. You type messages on your phone and they are encrypted and transmitted via the transceiver to a repeater or directly to the recipient.

Ham Radio





Ham radio: It's far and away the most reliable but also the most complex radio option. Ham radio frequencies are divided into three main groups: UHF (Ultra High Frequency), VHF (Very High Frequency), and HF (High Frequency). HF signals can bounce off the atmosphere and can give you ranges of hundreds or even thousands of miles under the right conditions.

The Simplest: GMRS Radio



If you're just looking for a reliable tool to communicate with family and the larger world during an emergency, go with GMRS. It's about as easy as a walkie-talkie, but way more powerful. It lets you talk to more people, including anyone else with a GMRS. Your $35 registration fee covers your whole family, with multiple radios.

The license lasts 10 years.

Also, there's no test.

GMRS uses 30 channels. They're already programmed for you.

Channels 1-7: Basic walkie-talkie channels, range 2-5 miles.

Channels 8-14: Restricted by FCC. Don't mess with these.

Channels 15-22: Maximum power channels. Use Channel 19 to communicate informally with other travelers. Use Channel 20 for emergencies. It's the widely used GMRS Emergency Channel.

Channels 23-30: Repeater Channels. These give you maximum range. You can talk to someone across town, up to 60 miles away. Go to myGMRS.com and find the channels used in your area.

Note the frequency and the privacy tone. Make sure the frequency isn't the same as any of the channels 15-22 you might use for group chat. If it is, switch to a different channel for group chat and use the repeater channel for long-distance comms and short emergency messages. Your instruction manual will guide you through this part.

Many cities have active GMRS communities that do nightly check-ins and severe weather updates in real time. If you want to build a resilient communication network without all the hassle of a Ham radio license, start with GMRS. It's straightforward.

Experts recommend the BTECH GMRS-PRO for beginners. It's simple. It's weatherproof. You can even submerge it in water for 30 minutes. It charges via USB-C.

During an emergency, these channels can all get congested. Be brief. Say your name, your status, your location. If you're moving to another channel, say that.

Then, get off.



Actually Using a Portable Ham Radio





Contrary to popular belief, it's legal to use a Ham radio without a license during an extreme emergency if you have no other form of communication. You can even program a radio and listen on it to make sure it's working. The only thing you can't do is transmit. Never transmit without a license, except during an emergency when you're facing an immediate threat. Don't abuse the exception. Also, choose your radio wisely.

It's a good idea to get your license and join a club, but you can also just get a Ham radio and learn the very basics of operating it during an emergency when phone towers go down. As long as you keep your messages brief and don't chatter, you'll be fine.

Experts recommend the BTECH UV-PRO IP67 Dual Band VHF/UHF Two-Way Radio. It's the easiest to use for a beginner. It charges through USB-C, just like a phone. It's light. It's weatherproof. It's durable. You can pack it into a bugout bag.

Replace the factory antenna with a whip antenna like the Nagoya NA-771 15.6 inch Whip VHF/UHF antenna (SMA-Female). It gives you a better range and a stronger signal. It's easier to replace, screws right on.

Ham radios can communicate to each other directly via Simplex or through repeaters. A repeater is just a giant, high-powered antenna station on a building or mountain. It boosts your signal so that anyone within 30-60 miles can hear you loud and clear.

Programming Your Radio:

You can use the smartphone app to program your radio, but you can also do it just with the keypad. Use RepeaterBook (www.repeaterbook.com) to look up your local repeater frequencies. You'll enter all four numbers listed for each entry:

1. Output Frequency: This is what you listen on.

2. Offset: This shifts your radio's transmit frequency up or down so the repeater can hear you.

3. Tone/CTCSS (PL Tone): It's basically a key that unlocks the repeater.

4. Mode (FM vs. Digital): Stick to FM entries in RepeaterBook.

When you press the talk button, make sure you wait a full second for the line to open. Otherwise, it will clip your message.

During emergencies, use 146.520 MHZ (2m VHF) and 446.000 MHZ (70cm UHF) with no offset and no tone. They act as universal hailing frequencies.

The BTECH UV-PRO IP67 comes with a clear instruction manual to guide you through the process. Don't get overwhelmed.

Remember to keep your messages short and only use it as a last resort.

Multiple members of your family or group can communicate directly with each other on Ham Radio, via Simplex Mode. But each of you needs a license.

Transportation: Bicycles

During emergencies and grid failures, you'll need different ways to travel. Bicycles offer one of the simplest ways of getting from one place to another. They're relatively cheap compared to other modes of transportation. They're plentiful. You can hitch carts and wagons to them to haul goods and materials. They're also easier to repair and maintain than most other modes. It's worth keeping a few bicycle repair manuals around.

This guide can't explain all the aspects of bicycle repair. Entire guides exist that spend hundreds of pages covering that topic. But we've included detailed instructions on common repairs like fixing flat tires and broken chains. These instructions come from MissionAssist/ECHO Community's open-source guides (echocommunity.org).

Some people might complain that bicycles only offer "city folk" a reliable means of transportation. Think again. Bicycles more than quadruple the speed of an average person, making them 3-5 times faster than on foot. They make transporting loads far easier. It doesn't really matter where you live, bicycles make life better.

Bicycles also offer a great mode of escape and evacuation. They can go places that cars and motorcycles can't. They don't require fuel or batteries.

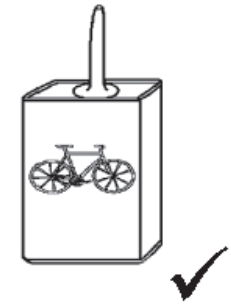
They're an underrated survival tool.



Bicycle Maintenance: Book 1

Introduction

Rust. If you let metal things get wet, they will sometimes go brown. The name of the brown coloured metal is 'rust', and the metal goes 'rusty'. Rust destroys metal like ants destroy wood. When you put oil on, it stops water from touching the metal, and so it will not go rusty.



✓

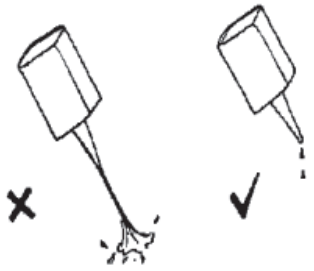
Cycle oil is very thin. Oil used in a car engine is much too thick to use on a bicycle.



X

Do not use too much oil. Too much is often worse than too little as dirt and dust will stick to drops of oil that are not wiped away. So only use one or two drops of oil at a time, and always remove any extra oil with a cloth or rag.

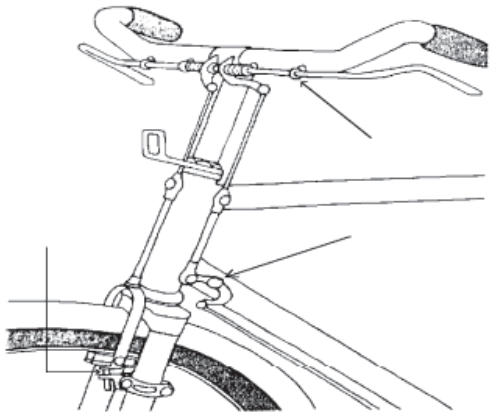
When a bicycle is used all the time, oil the bearings and the chain every two weeks.



A **bearing** is where two metal parts move against each other.

Front Brakes

Put a drop of oil on the handlebar bearings, the pivot guide and the stirrup guide. Be careful not to let the oil drop on to the wheels or near the brake blocks.



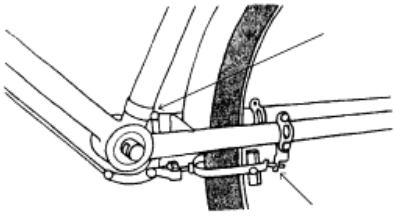
Some bicycles have calliper brakes, which have flexible cables instead of rods. These cables will need to be oiled every few months, or as soon as the brakes start to feel stiff.

Get someone to squeeze the brake blocks together; this will loosen the wire and you should be able to release the end at the brake handle by twisting it out of its slot. If this doesn't work, free the wire by the brake block pivot by unscrewing the holding clamp. Hold each wire upright and let some oil run down between the wires and the outer casing, while running the wire up and down inside the casing.



Back Brakes

Put a drop of oil on the pivot guide and the stirrup guide. Be careful not to let the oil drop onto the wheels or near the brake blocks.



Front Wheel

There is a spring clip on the hub of the front wheel that covers a hole in the hub. (There may be one on the back wheel as well.) You can move the spring clip around so that you can see the hole. Put two or three drops of oil in the hole and move the spring clip back. This will keep the oil in.



Do not let dirt get into the hole.

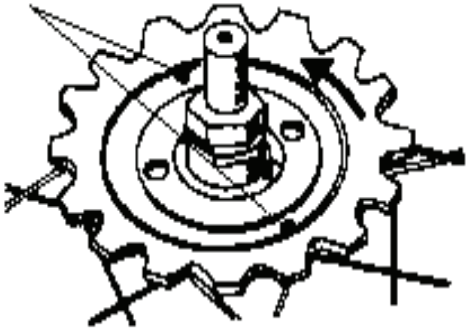
Back Wheel

Some bicycles have two holes in the side of the gearwheel. Put a drop of oil in each hole.

Do not let dirt get into the hole.

If there are no oil holes, then let a few drops of oil lubricate the two surfaces of the free wheel unit.

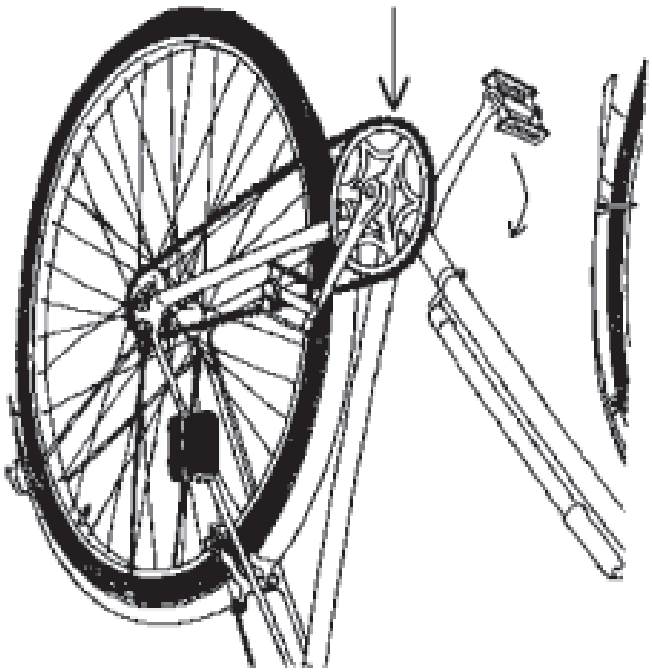




The Chain

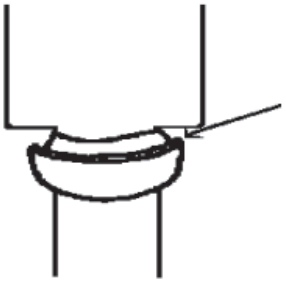
A chain is made of little links fastened together. The links must move freely around the gear wheels. If the links become dry or rusty, it will be difficult to turn the pedals, and the chain might break.

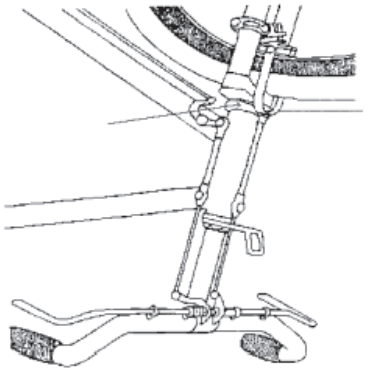
Turn the bicycle upside down and let some oil drop on the chain while you slowly turn the pedals round. Remove any extra oil.



The Head Bearings

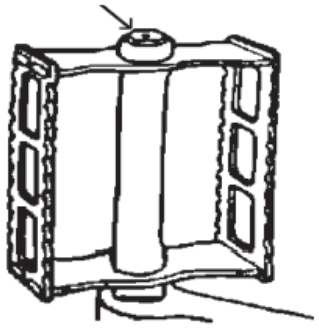
Turn the bicycle upside down, and put a few drops of oil where the handlebars move in the Head Bearing.





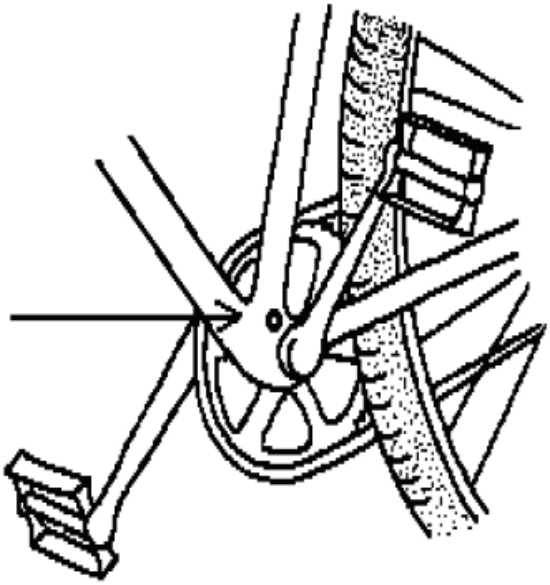
The Pedals

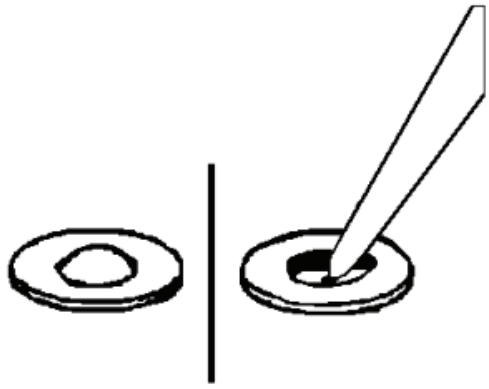
There is a hole in the end of each pedal. If there is dirt in it, clean it out with a sharp stick or a metal point. Put a few drops of oil in the hole.



The Bottom Bracket Bearing

There is a hole in the bottom of the frame that has a small metal ball in it. The ball keeps the hole closed. Push the end of the oil can against the ball and put a few drops of oil in the hole.





Bicycle Maintenance: Book 2

Puncture repair outfit

If the inner tube is punctured, you need a puncture repair outfit. It should contain:

An abrasive stick or some sand paper for cleaning the tube

Rubber Solution

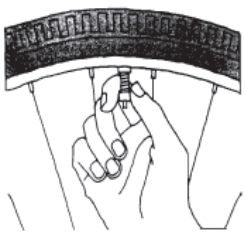
Rubber Patches

Some powdered chalk

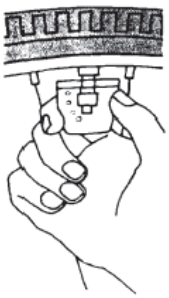
3 Tyre levers.

If you do not have proper tyre levers, you can use spoon or fork handles so long as they have rounded ends.

Check the valve



Sometimes air will leak out of the valve. It might go very slowly. You can check by putting the valve in some water. If air is getting out, you will see bubbles in the water.



You can also wet the end of the valve with your finger. If air is coming out, you will see a small bubble which will slowly get larger.



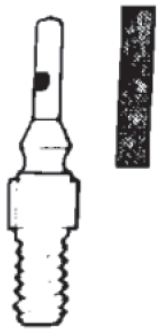
Mending a faulty valve

There are two types of valve. The older type has a small rubber tube placed over metal tube. The newer type is called a Schrader valve, and is all in one piece.



A Schrader valve cannot be mended, and so if it is faulty, it must be replaced.

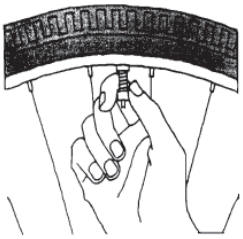
If the faulty valve is of the older type, remove the rubber, blow through the stem hole to remove any dirt, wet the valve stem and push a new valve rubber all the way down over the stem.



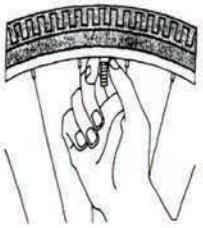
Removing the tyre

If the valve is not faulty, then you will have to remove the tyre.

Unscrew the nut that keeps the valve holder in the wheel rim, and take the valve out.



Unscrew the lock nut and push the valve holder up inside the wheel rim. Keep the small pieces safe, and don't let them get dirty.

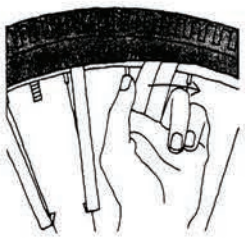


Examine the tyre to see if there is any obvious damage caused by sharp stones or nails, thorns etc. If there is, note the position on the tyre.

Insert a tyre lever between the rim and tyre. If it is obvious where the puncture is, start near that point. Lever the tyre off, being very careful not to nip the inner tube between the lever and the rim of the wheel. It's easy to make another puncture!



Force the lever right down until you can hook the end around a spoke. Insert another lever a little way along the tyre, and hook that one around a spoke, and then do the same for the third lever.



The middle lever should then be easy to take out, so use it to lever off more of the tyre, and keep doing this until you can run your finger right round the wheel between the rim and the tyre. One edge of the tyre is now out of the wheel. (Be careful that the tyre levers do not come unfastened, or they will spring out and might hurt you).

Removing the tube

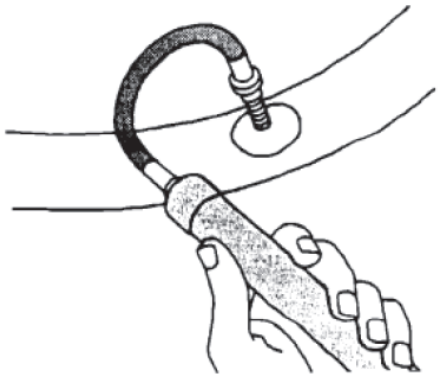
Push the valve holder right through the rim, and gently pull the tube and valve holder out. Continue to pull the tube out all the way round the wheel, being careful not to damage it while pulling it past the brake blocks.

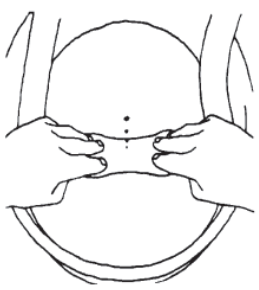


Finding the puncture

Replace the valve and its retaining nut and pump the tube up just sufficiently for it to be filled with air.

You can usually find the puncture by moving the tube slowly past your ear or lips.

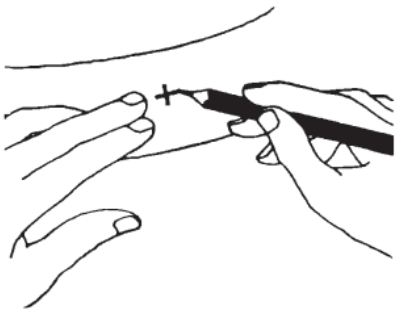




If you cannot hear or feel it, pass the tube slowly through a bowl of water. Bubbles in the water will show you where the air is escaping.

Marking the puncture

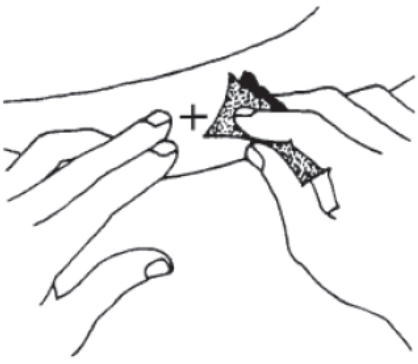
Once you have found where the puncture is, mark its position in some way. Your repair kit may have an indelible pencil; if not a bit of burnt wood will do - or just keep you finger there!



Examine the tyre near where the puncture is to see if there is still anything sharp stuck in it. If there is, make sure it is removed. If this leaves a large hole, then you need to stick a piece of canvas or rubber inside the tyre to cover the hole.

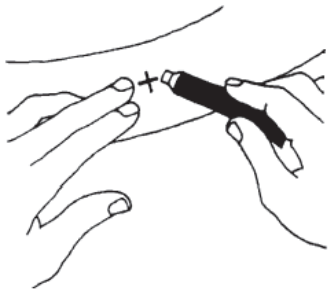
Cleaning the tube

Clean the area with sand paper or the moistened abrasive stick from your repair kit. If you don't have these, use a cloth soaked in a little petrol.



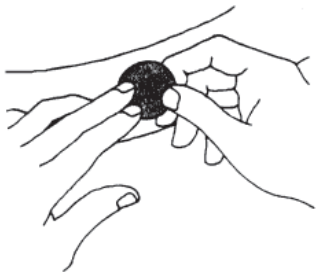
Spreading the adhesive

When the area is clean and dry, spread some adhesive thinly over the surface around the mark and leave it until it is almost dry. Make sure you cover an area larger than the patch you are going to use.



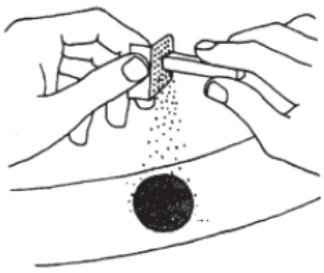
Fixing the patch

Peel off the back from a patch, and press the patch, tacky side down, firmly over the puncture.



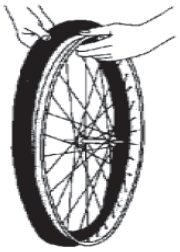
Dry the adhesive

Dry any surplus adhesive with powdered chalk. If solid chalk is provided in the kit, scrape it on the grater over the patch, and rub the chalk lightly over the surplus adhesive. If you don't have any chalk, some fine dust will do, but make sure that you do not leave any grit on the tube.



Refitting the tyre and tube

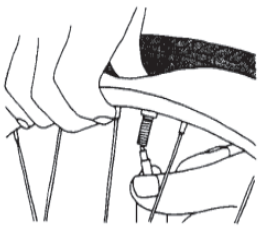
Make sure that one side of the tyre is over the whole edge of the wheel rim, and that the rim tape is in position.

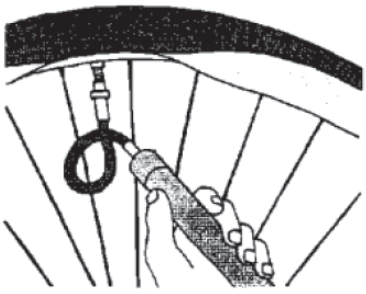




Pull the free edge of the tyre back over the valve hole in the rim, and push the valve holder through the hole. Pull the tyre back over the inner tube.

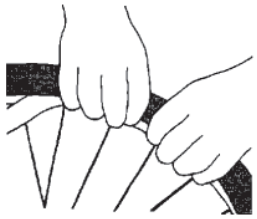
Screw the lock ring on to keep the valve holder in place, but don't tighten it right up. Replace the valve, and screw up the retaining nut.

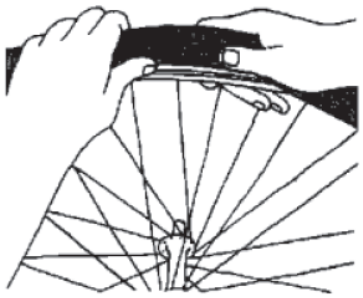




Pump a little air into the tube, but don't make it too hard.

Roll the inner tube all the way around until it fits into the centre of the rim.

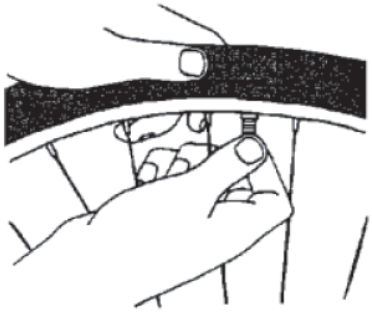




Ease both sides of the tyre around the inner tube. Roll the last part of the tyre on with the balls of your thumbs. Make sure that no part of the inner tube is nipped by the tyre.

Loosen the valve locking ring, push the holder up into the rim, and then pull it out again. Screw the locking ring tight, and pump the tyre up a bit more.

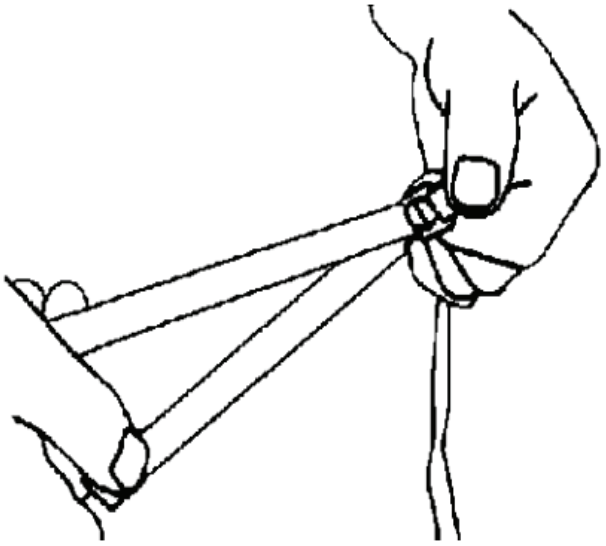




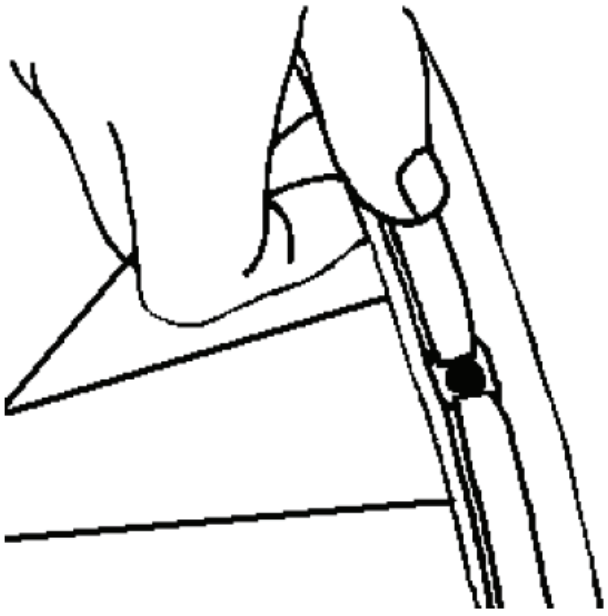
Check again by squeezing both sides of the tyre all the way round to see that none of the inner tube is caught between the tyre and the rim. You can then pump the tyre up until it is hard.

The Rim Tape

Inside the rim, a webbing or rubber tape protects the inner tube from the spoke nipples. It should rarely need to be replaced, but if it becomes frayed or perished the inner tube may become damaged, and a new tape should be fitted.

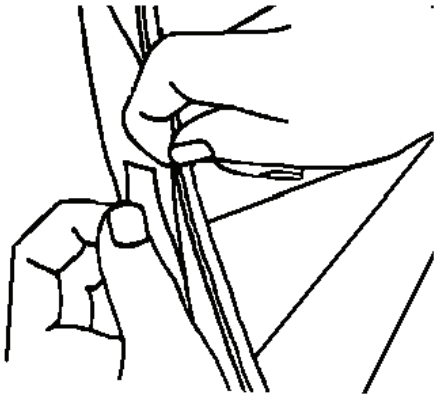


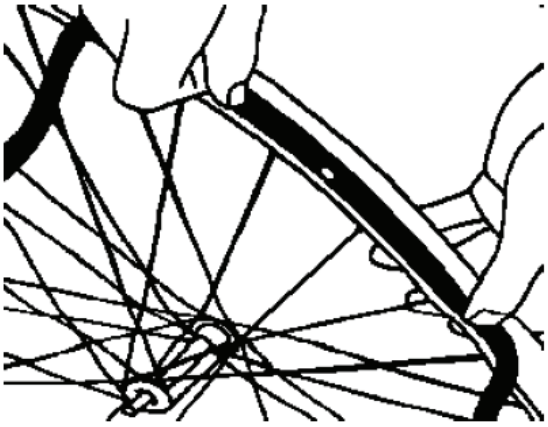
To fit the webbing tape, open it with the convex side of the eye downwards, and pass the free end through the slot from the top.



Line up the metal eye in the tape with the hole in the rim that takes the valve, and loop the tape around the inside of the rim. Make sure that it lies flat and is not twisted.

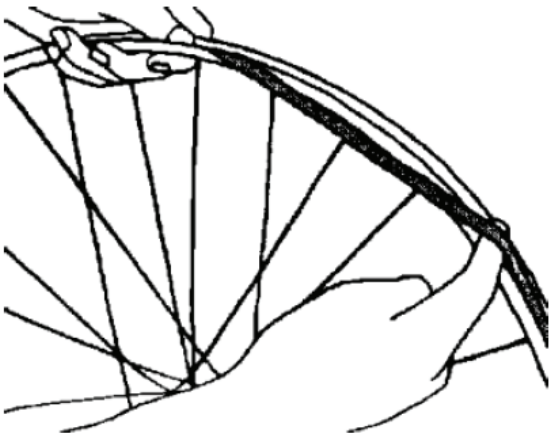
Make sure that the eye remains lined up with the hole, pull the tape tight, and tuck the end of the tape under to hold it fast.





If you have a rubber rim tape, fit the convex side into the rim. Line up the eye with the valve hole, and feed the tape around the wheel.

Draw a finger under the rubber rim tape as it springs over the rim. Make sure that it sits centrally in the well of the rim and is not twisted.



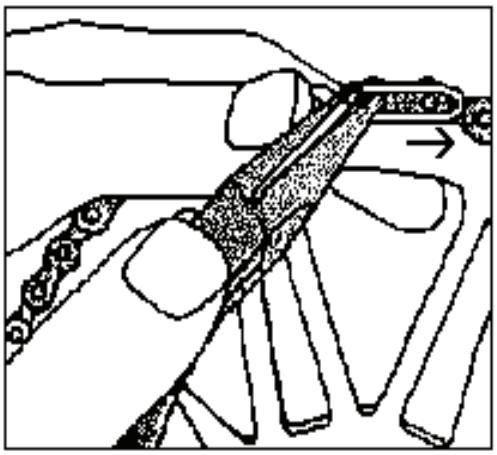
Bicycle Maintenance: Book 3

The chain

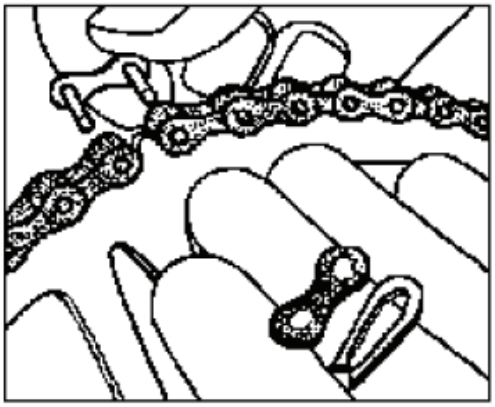
The bicycle chain consists of a number of links which are fastened together with rivets. At one point in the chain there will be a special connecting link which can be taken off to release the chain.

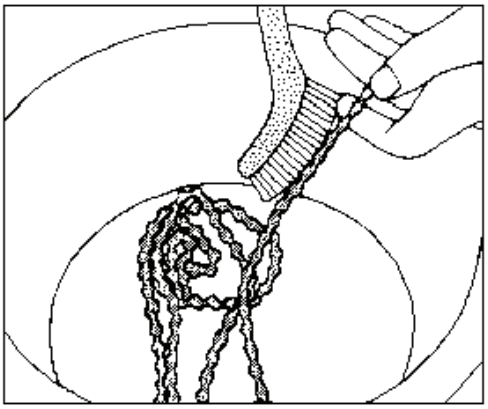
If the chain gets worn or dirty, it will make a grating sound, and it will be difficult to push the pedals round. Wrong tensioning of the chain can also cause wear, and so it is important that the chain is properly fitted, and that it is kept clean and well lubricated.

When the chain gets very dirty, it should be removed from the bicycle so that it can be cleaned properly. Find the special connecting link - it looks different from all the others - and take the spring clip off. You will need a small pair of pliers or a small flat screwdriver to force the ends apart and over the end of the rivet.



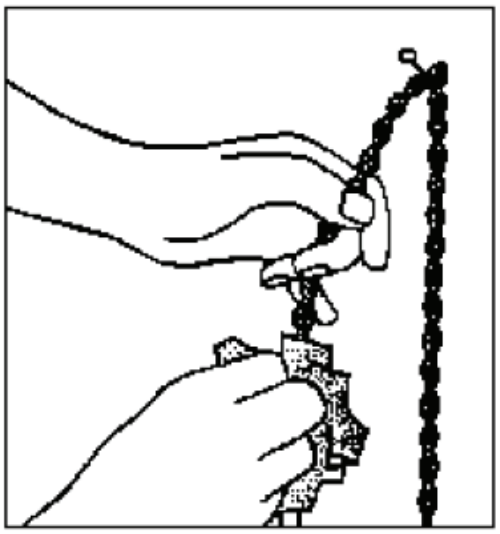
When the clip comes off, take the side of the link off, and pull the rest of the link out of the chain. You can then take the chain off the bicycle.



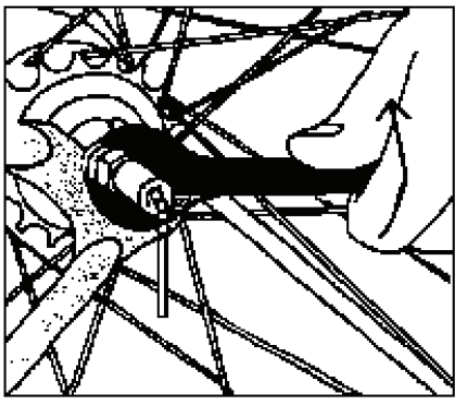


Soak the chain for a few hours in a bowl of paraffin, and then use a wire brush to remove all the old oil, dirt and grit.

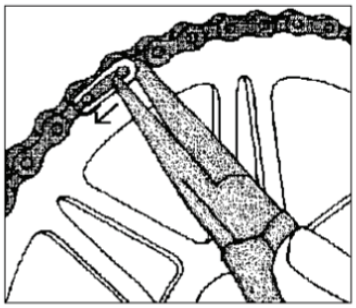
When it is clean, hang up the chain to let the paraffin run off, and then dry it with a clean rag. Make sure that no cloth is caught in the links.



To refit the chain, first loosen the rear wheel nuts and move the wheel forward as far as it will safely go. Replace the chain around the two gear wheels, with the two ends on top of the larger (pedal) wheel.

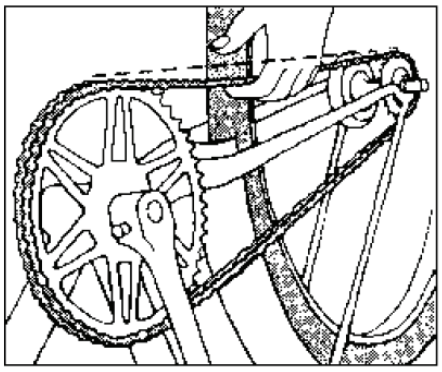


Fit the connecting link back in and place the spring clip over one of the rivets so that the closed end faces the direction of travel. Press the open ends over the other rivet and make sure that the clip fits into the grooves on the rivet. You may have to use pliers or a screwdriver again.

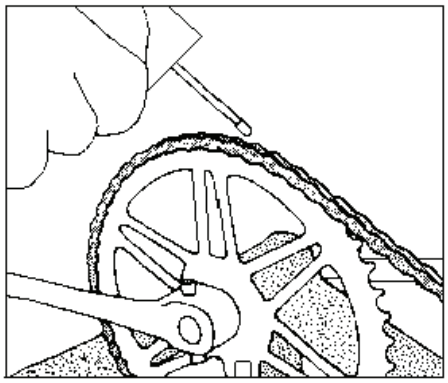


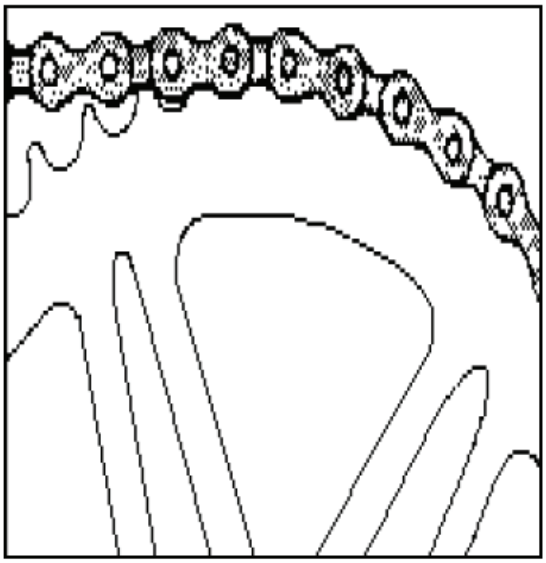
Slide the rear wheel back until it pulls the chain tight - but not too tight.

There needs to be about half an inch (13mm) play in the chain at a point midway between the gear wheels. Tighten the wheel nuts securely.



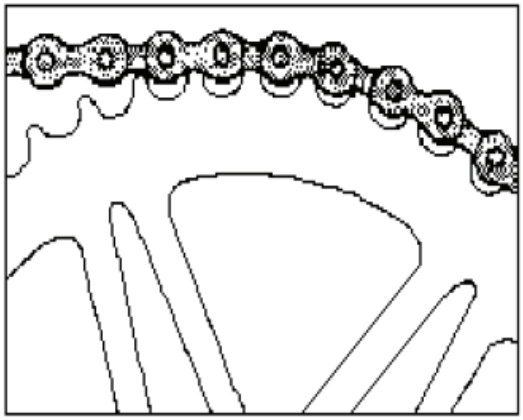
Now oil each link with cycle oil.





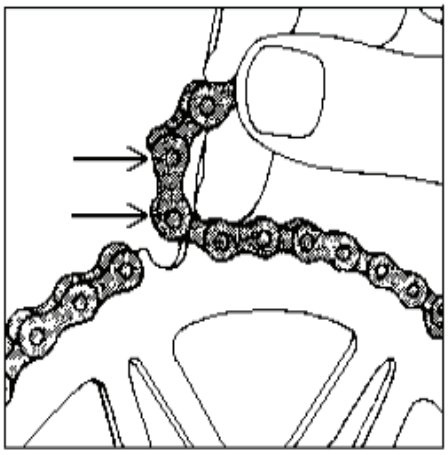
Test that the chain fits properly by seeing that the links bed down between the teeth on the gear wheel. The teeth of the wheel should not be visible when the chain is lying on them.

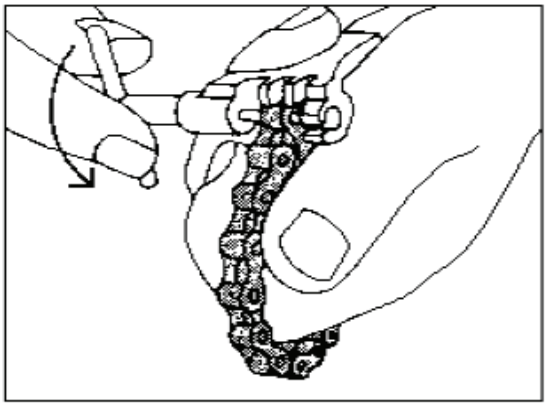
If the chain is worn or damaged, some of the links will ride over the top of the gear wheel. If this happens, the chain should be replaced.



A new chain

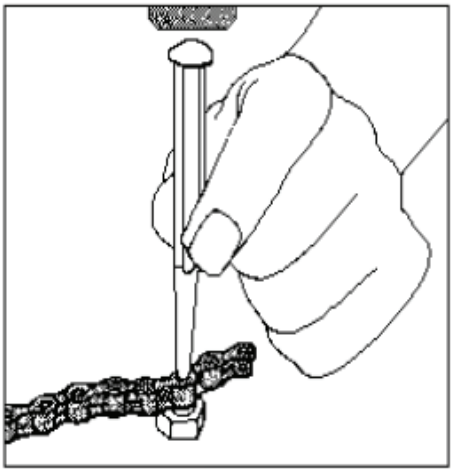
A new chain may need to be shortened to fit the bicycle. You do this by removing one or more links. Fit the chain tightly over the two gear wheels and note the rivets which need to be removed. See the picture.





There is a special tool for removing rivets. It fits over the chain, and when the handle is screwed it pushes the rivet out. If you do not have this special tool, then lay the chain on its side with the rivet over the centre of a small nut, and tap the rivet out, using a fine punch or nail.

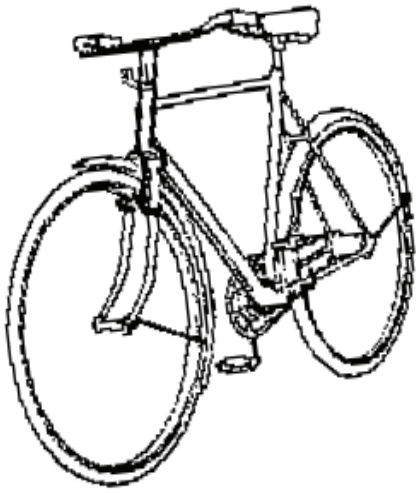
If you have to remove only one link, you will be left with the special connecting link, but if you have to remove more than one link, you will need to separate the connecting link as well.

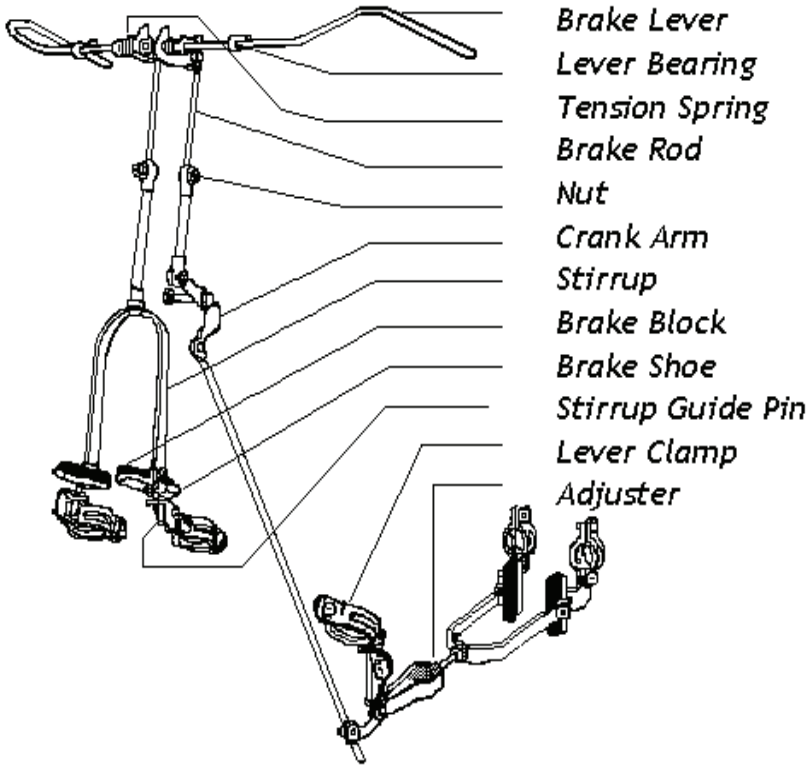


Bicycle Maintenance: Book 4

How to Adjust the Brakes

There are two different designs of bicycle brakes. The older type, and that used on bicycles that are used mostly for everyday work, is operated by a system of rods and cranks.



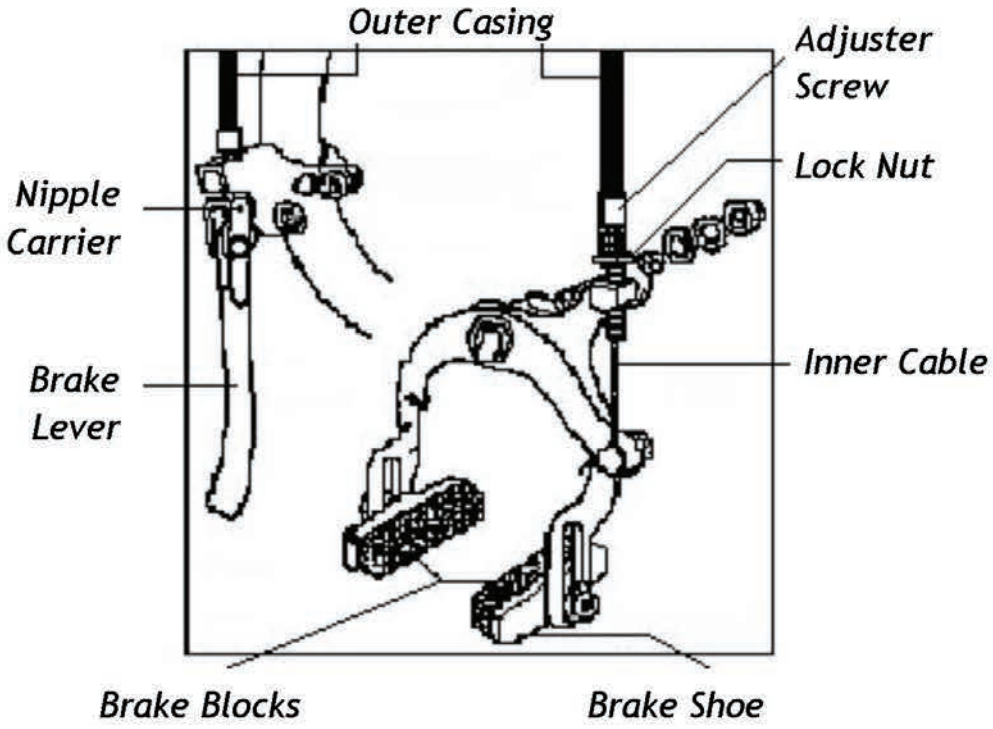




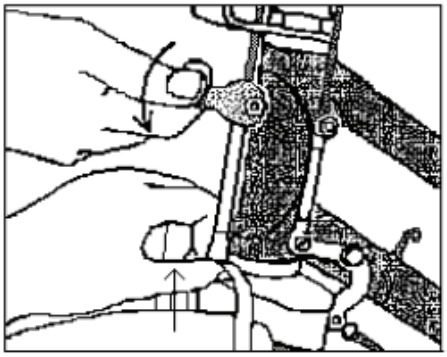
The newer type, which is used more on sports or racing bicycles, operates by a flexible wire that runs through an outer casing. The casing is fixed at both ends. When one end of the wire is moved by the brake handle, the other end moves to apply the brake blocks to the wheel rim.

This type of brake is known as a cable or caliper brake, and it is easier to adjust than the rod brake.

The pictures show the two types, and the names of the parts.

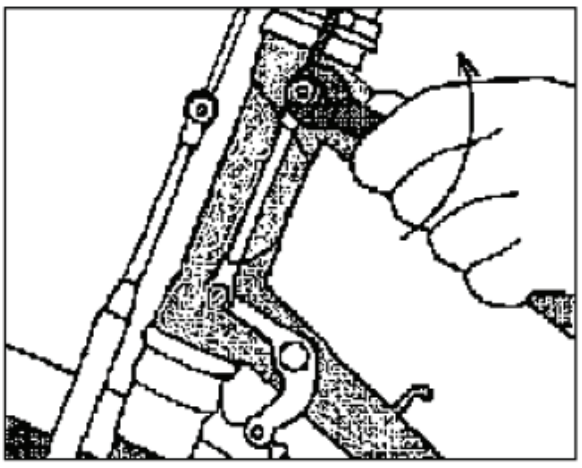


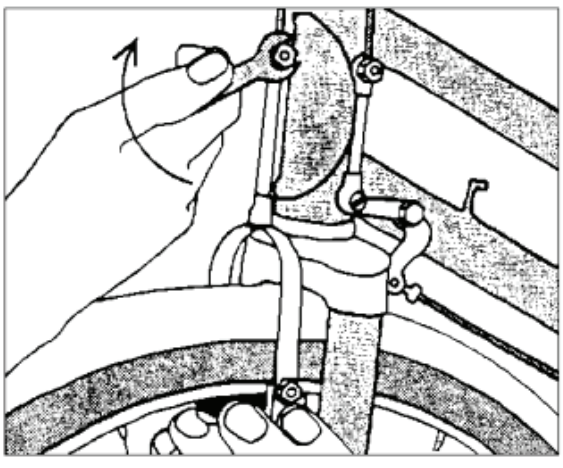
Before you adjust a rod brake, check that the pivot points on the rod linkage are oiled and move freely. If any of the rods are bent, then try to straighten them. You need a screwdriver, and a spanner to fit the nuts on the rods and on the rear stirrup.



Loosen the nut on the front rod. Hold the brake lever on and lift the stirrup so that the brake rod slides further down into the tube.

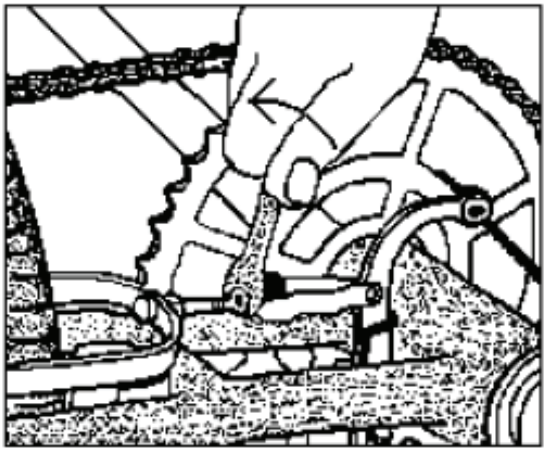
Raise the stirrup so that the brake blocks are about 1/8th of an inch (3 mm) clear of the rim of the wheel. Partially tighten the nut on the rod to keep the stirrup in position, spin the wheel to make sure that the brake blocks are clear all the time, and then fully tighten the nut.

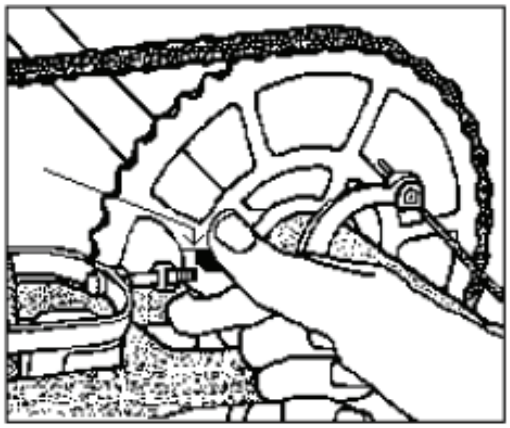




Slacken the nut on the rear brake rod (underneath the handlebars). Adjust the rod so that the top of the crank arm is in line with the down tube of the cycle frame.

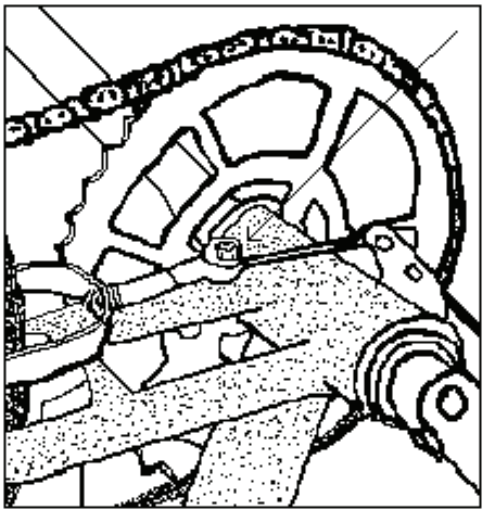
Turn the bicycle upside down. There are two different designs for the back brake linkage. If yours is like the picture here, loosen the lock nut on the adjuster with a spanner, and run the nut to the end of the thread.



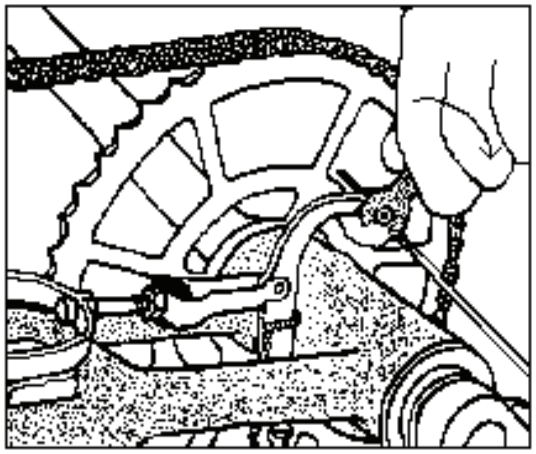


Move the stirrup until the blocks are about 1/8th of an inch (3mm) from the rim. Screw the adjuster to secure it, then tighten the lock nut.

If your back brake linkage is similar to the front brake, as in the picture here, loosen the nut and slide the stirrup along the brake rod until the brake blocks are about 1/8th of an inch (3mm) from the rim.

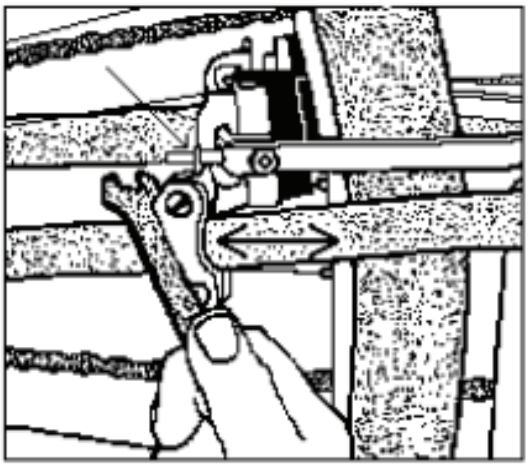


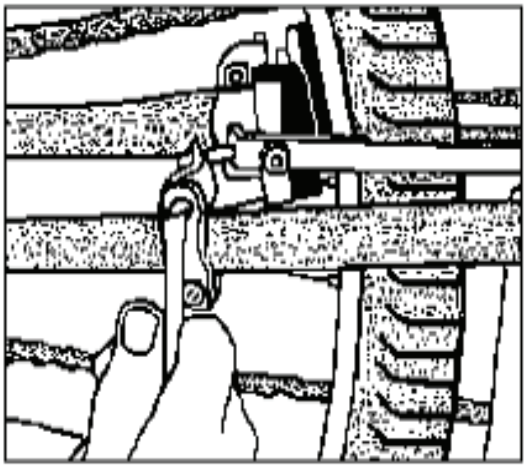
Partially tighten the nut to secure the stirrup, spin the wheel as before, and then fully tighten the nut. The connection between the down tube brake rod and the stirrup should not need adjusting, but check that the nut is tight.



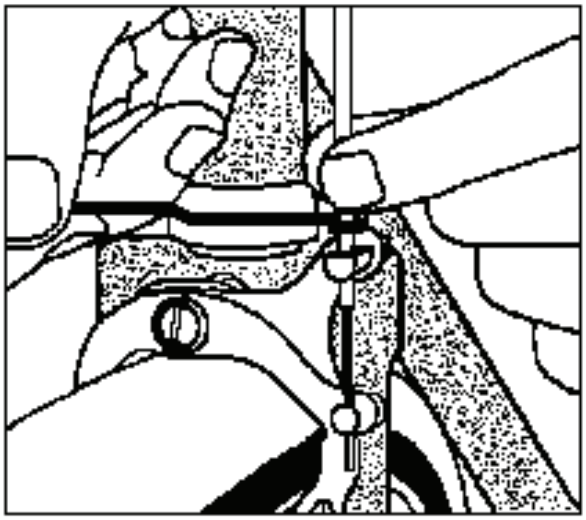
After the brakes have been adjusted, the stirrup guides may need to be adjusted as well.

First, loosen the screws on the clamp.





Make sure that the stirrup pins are in the guide holes, and tap the guides along the frame tubes until the guides are about ¼ inch (6mm) away from the stirrup. Tighten the screws to secure the guides.



If you have cable (caliper) brakes, turn the adjuster screw on the end of the brake cable until the brake blocks are just clear of the wheels. When they are in the right position, lock the screw in position with the lock nut.

Brake Blocks

Brake blocks (which are fastened into brake shoes) are the small pads that are squeezed against the wheels to slow the bicycle down or to stop it. When they get worn, it is dangerous to ride your bicycle, as you will not be able to stop in an emergency. The brake blocks need to be changed, and both blocks on the same wheel always need to be changed at the same time.

To change the brake blocks you will need:

A new set of brake blocks,

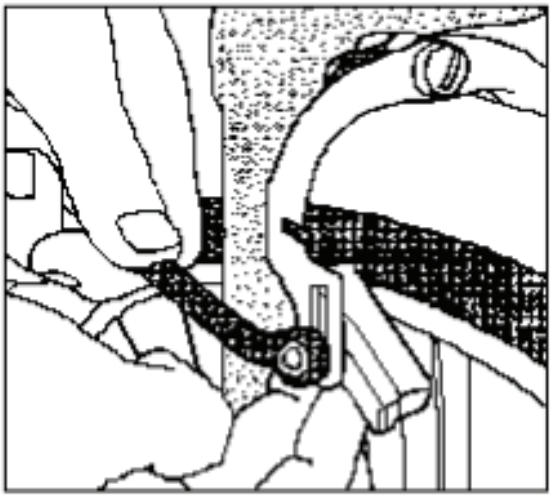
A spanner to fit the brake shoe nut,

A screwdriver,

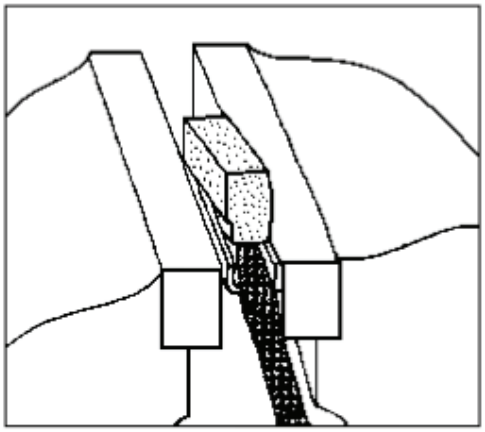
A hammer.

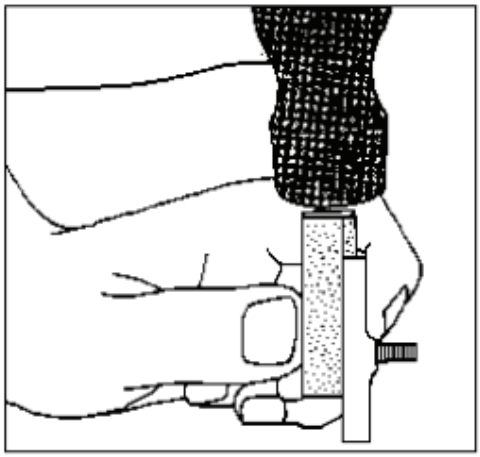
Two pairs of pliers and a vice will also be useful.

Undo the nut which holds the brake shoe to the stirrup and slide the shoe out of the bracket.



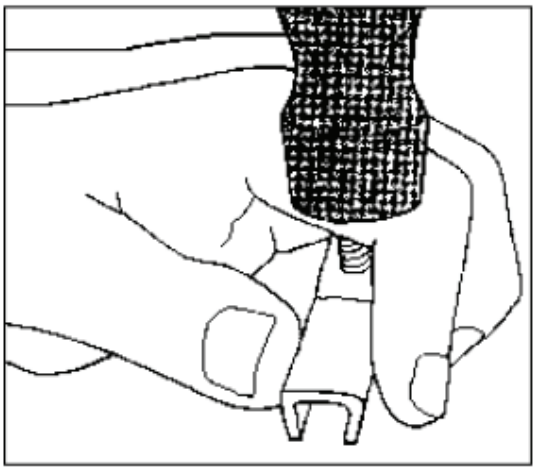
Use the screwdriver to lever the old brake block out of the shoe. It will be easier if you can hold the shoe in a vice.



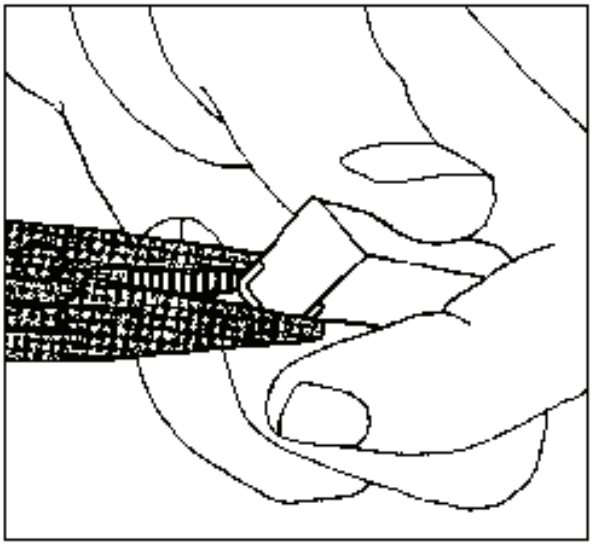


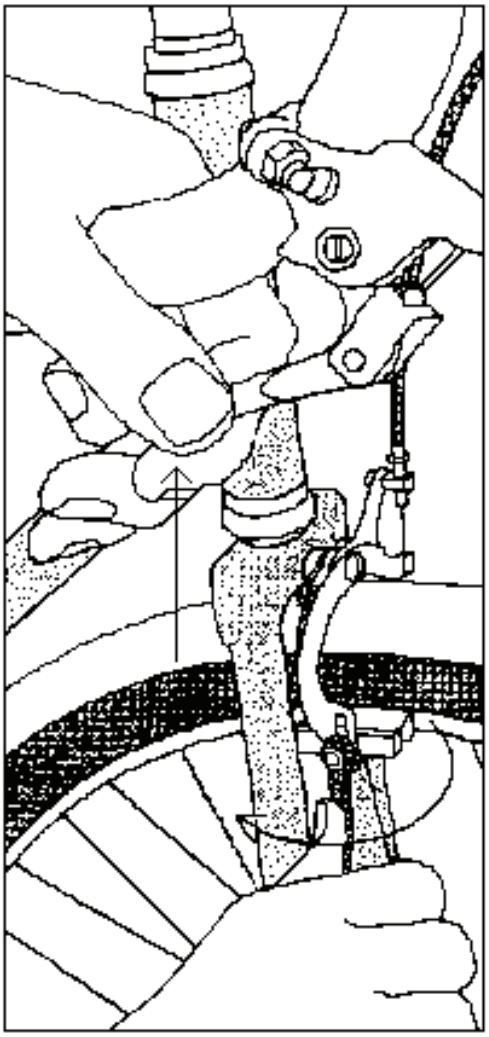
Tap the new brake block in with the hammer.

You might have to slightly widen the jaws of the shoe with the pliers, or by lightly hammering the shoe base, but the block must be a tight fit, and not just drop into the shoe.

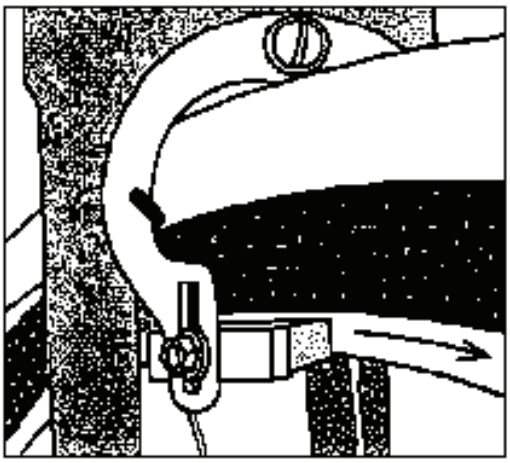


When each new block is in its shoe, pinch the open end of the shoes together with the pliers so that the blocks are held firmly.





When you have both shoes fitted with the new blocks, fit them back into the brackets and line them up with the wheel rim. Hold the brake handle on so that the blocks are firm against the rim, and tighten the nuts. Make sure that the closed ends of the shoes face in the same direction as the direction the wheel travels.



If the blocks are fitted the wrong way round, they will slide out of the shoes when you put the brakes hard on. That would be very dangerous!

Bicycle Maintenance: Book 5

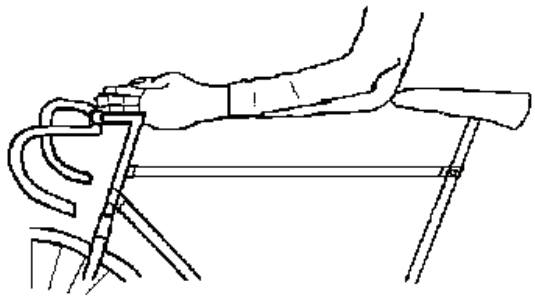
Safety, comfort and light repairs

Whether you have an old bicycle or a new one it is essential that you keep it in good condition. Your cycle will give you many years of good service if you take care of it regularly. If you have to cycle on rough ground you will need to keep the cycle especially clean. Dry off the cycle if you travel in the rain or through rivers. If the cycle tyre gets a puncture you should be prepared so that you can repair it. Rough surfaces can also damage many parts of your bicycle, and so you may at some time need to make small repairs to it. Some suggestions of what might be required are shown in this book.

It is also important that you adjust your bicycle so that it is safe and comfortable to ride.

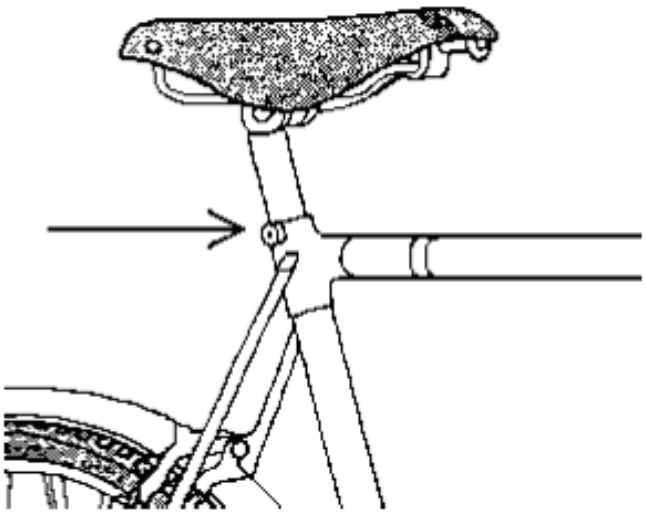
The saddle

Saddle Position. Hold your arm out with your elbow against the front of the saddle. Your fingertips should just touch the middle of the handlebars. If they don't, most saddles can be adjusted by slackening the holding screw and sliding the saddle in its clip. You might also be able to reverse the clip to get a small amount of extra length.



Saddle Height. Your saddle is the right height when you can sit on the saddle with your heel on the pedal as low as it will go. This will mean that your leg should be straight, but not stretched, when the ball of the foot is on the pedal at its lowest position. You should also be able to sit on the saddle so that the toes of both feet just touch the ground. Raise or lower the saddle to get the right fit by loosening the nut at the bottom of the saddle post and sliding the post up or down. Always leave at least 5 cm (2 inches) of seat post inside the frame - there is normally a mark to show the danger point.

Re-tighten the nut and bolt very securely.



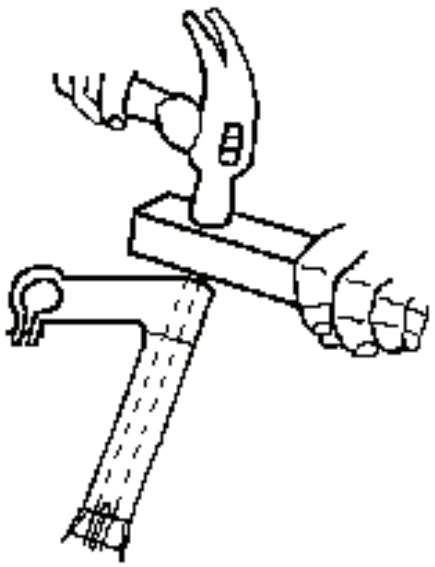
For someone who is just learning to ride a bicycle, the saddle should be a bit lower, so that both feet can be put flat on the ground while sitting on the saddle.

Handlebar height

The top of the handlebars should be roughly level with the top of the saddle.

Handlebar adjustment

The handlebar post holds the handlebar in position and fits into the fork tube. On most bicycles an expander bolt with a wedge-shaped nut at the bottom end goes inside the post. When the expander bolt is tightened the wedge forces the side of the stem outwards, and jams it in place. To raise or lower the handlebars, first loosen the expander bolt by two or three turns. Then tap the bolt downward with a hammer on a piece of wood. This loosens the wedge nut without damaging the metal or ball bearings. Adjust the height and then re-tighten the nut.



Brakes

Looking after your brakes is especially important. You must always have two brakes in good working order. Don't leave it until an emergency or going down a steep hill in the wet to find out whether your brakes work properly or not! Check your brake blocks regularly and if they are badly worn, replace both on the same wheel at the same time. You can find out how to adjust the brakes in Book 4, and how to lubricate them in Book 1.

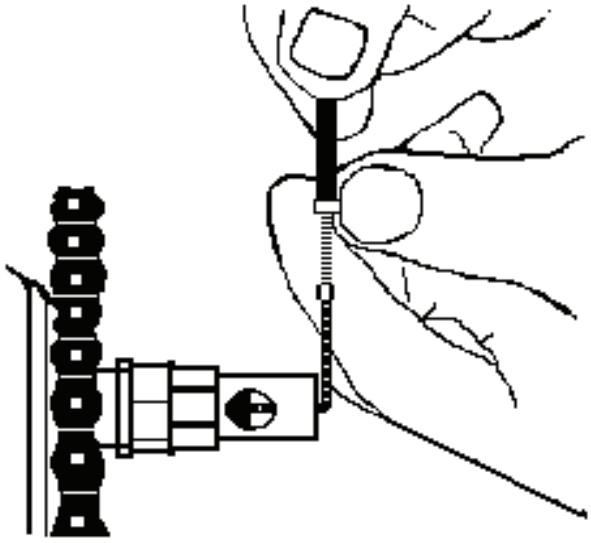
Gears

Some bicycles are fitted with gears. These allow you to go faster on the level while pedalling at the same speed, and easier to go up hill, although you will have to pedal faster.

Gears inside the hub on the back wheel are usually very little trouble as all the parts are enclosed. There are usually three different gears; bottom gear is for starting and going up steep hills, second gear is for getting up speed and going up slight hills, and top gear is for going fast or easily on the level.

The gear lever mechanism is moved by a wire which is attached to a trigger on the handlebars, or sometimes on the crossbar. You should ease off pedalling when you change gear, or the mechanism might not move correctly inside the hub.

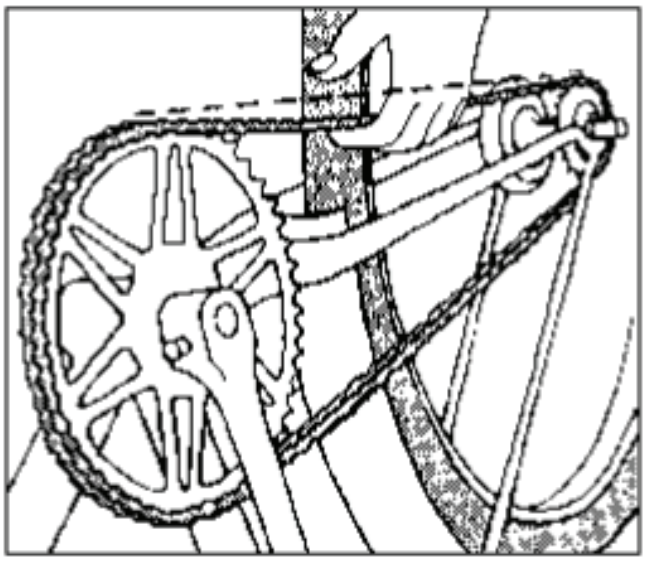
If the gears slip, they can be adjusted by turning the small screw on the wire near where it comes out of the hub. There may be a locknut which will need to be loosened first. Rest the bicycle against a wall, put the trigger in the top gear position, and tighten the cable until you feel pressure. Test the other gears by working the trigger and turning the pedals slowly backwards until you hear the gear click in. Then test the gears by riding the bicycle slowly. You may have to adjust the cable a few times before all the gears work properly. Don't forget to tighten the locknut.



The Chain

The chain needs regular attention, especially in wet weather. Without regular oil or light grease it will go rusty and stiff and make cycling hard work.

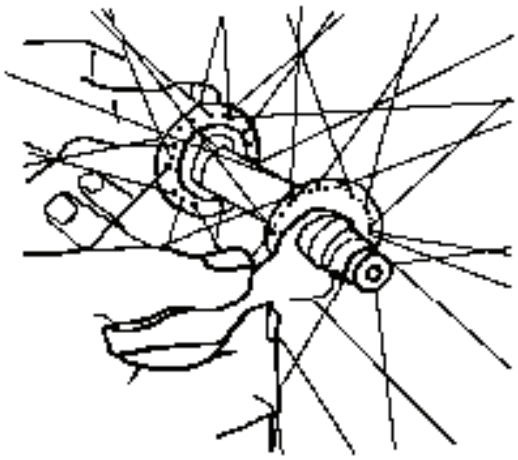
If your chain sometimes comes off it may be too loose. To test the chain tension, put something like a screwdriver under either the top or bottom part of the chain, halfway along. If you can lift the chain more than 2 cm (¾ inch) it is too loose and will need tightening. How to do this, and care of the chain generally, is described in Book 3.



If you have a chain guard and hear a clicking sound as you pedal, the chain guard may be bent and pressing on the chain or touching the crank. Check that it is not loose, and gently bend it back if it has become bent.

Hubs

If the wheel can be moved from side to side while it is mounted on the frame, then the hub needs to be adjusted. On one side of the hub (usually the left-hand side) there is a locknut and a cone. The cone has two flat surfaces for a spanner. Undo the locknut from the cone. Hold the axle with fingers or pliers and screw the cone right in, and then loosen it a quarter turn. Lock it in place with the locknut. Test for movement from side to side. The wheel should spin freely without sideways movement.



Tyres

When your tyres become worn, they should be replaced. Worn tyres are more likely to get punctured, and smooth treads can be slippery on a wet road.

Lights

Riding in the dark without lights is dangerous.

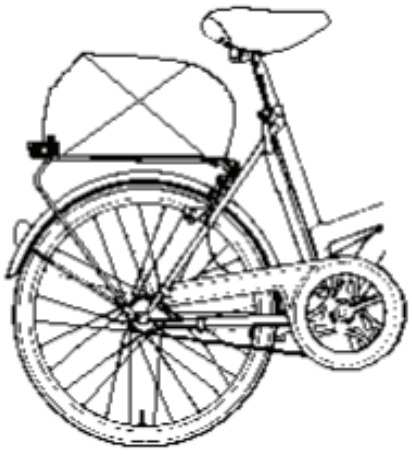
You should have a white front light, a red rear light, and a red rear reflector. Make sure that they can all be clearly seen, and that your lights are clean and shining brightly when you set out.

Carry a spare set of batteries and spare bulbs with you if you are going on a long journey and might be travelling in the dark. You can sometimes buy a small case which will strap onto the back of the saddle to keep your small tools and spare parts. If you carry spare bulbs, wrap them in cloth so that they do not get broken.

Luggage

If you carry luggage with you, say clothes or books, be careful to pack them well so that they do not fall off or jam the wheels.

It is better to buy a saddlebag or a carrier that fits over the back wheel. It is also important to keep your trouser legs from getting into the chain. You can fasten string or clips round your ankles - this also keeps your trousers clean and free from oil!



Tools

It is wise to always have a set of tools for your bicycle. You will find these to be useful:

1. A pump
2. A puncture repair kit, with spare patches, adhesive, chalk, and spare valves or valve rubbers.
3. A bicycle spanner (Bicycle nuts are usually of a different size than car nuts)
4. Two, or preferably three, tyre levers
5. A screwdriver
6. A rag (to clean yourself with!)
7. An allen key to fit saddle and handlebar fittings, if necessary
8. A can of cycle oil
9. A spare inner tube to fit your tyre size and your pump connector, unless you have a supplier nearby who will have one in stock when you need it.

Safety

Before a journey check that:

1. Both tyres are inflated to their proper pressure and that there is nothing sharp in the tyres that could cause punctures.
2. Your brakes work effectively.
3. There are no rubbing sounds that could show that something was loose.

During a journey:

When braking, either suddenly or normally, use both brakes together. Try to apply the back brake just before the front brake. Using the front brake on its own or too violently, can cause a skid or even throw you over the handlebars.

When going downhill, freewheel rather than pedal. Don't go too fast!

If you have to cycle in a town always be aware of the other traffic, and cycle with care.

Always be alert to what is going on around you - either other vehicles or pedestrians.

Be careful when overtaking parked cars - someone might suddenly open a door, and another car might be overtaking you!

Remember that the drivers of large lorries cannot always see cyclists.

If you are unsure which road to take - stop and work it out.

Make sure you understand the road signs and the hand signals you need to make.



Survival might start with stocking up on food or packing a bag, but it leads to so much more.