

Tools and tactics to help you navigate

Navigation

Smaller "Ultralight" Kit

- Compass (1)
- Flashlight (1)

Additional items in full "Hiker" Kit

- Waterproof notebook
- Mechanical pencil
- Pen
- Sharpie
- Flagging tape (15 feet)
- Extra battery for flashlight

Your own additions

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Key points

- Don't rush; take the time to maintain a sense of direction
- You can use natural features (sun, stars) to gain a general sense of direction
- Be aware of magnetic declination when using your compass

First, assess your need for urgent movement. Are you in a dangerous place, like a dry creek bed which can flash flood? Or a ridge exposed to lightening? Remove yourself from immediate danger by trying to find a nearby place that provides some shelter from the elements. Then try to make yourself noticeable with your signaling techniques.

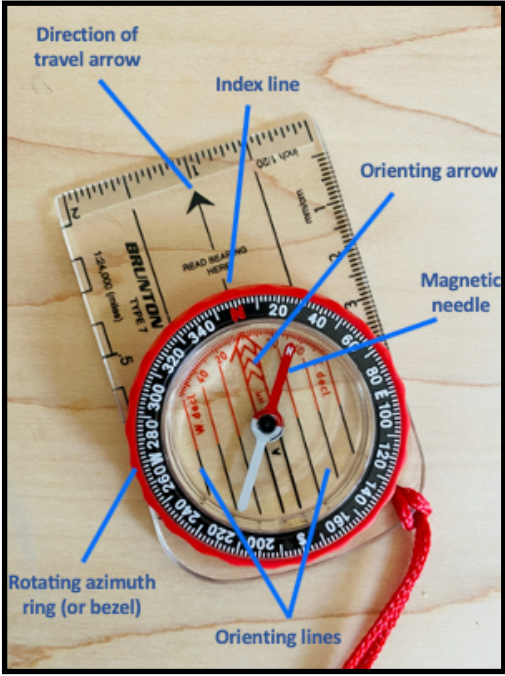
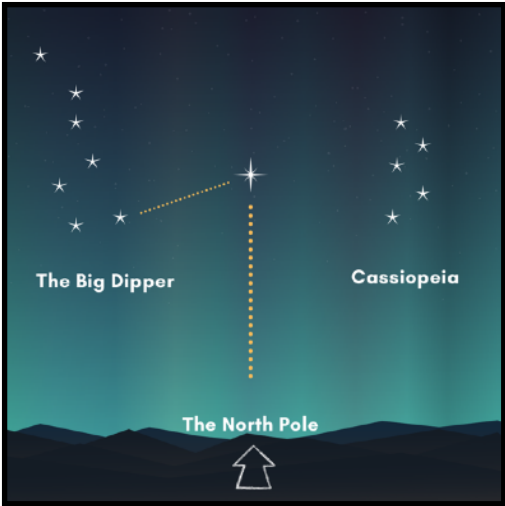
Now the big question: to stay or go? The general advice is to stay put and concentrate on signaling for help, but only you know the exact circumstances. Are other people likely to be in your area? Will somebody look for you soon? Do you have an injury that needs urgent attention? Think carefully, then act decisively. Right now, if you are sitting by a fire in a fairly safe area and blowing your whistle in intervals, you are doing pretty well. Take a minute to slow down and take stock of everything around you. Sometimes our rush to fix whatever got us into this situation causes a bit of an overload and we can miss things that might help us later. One simple thing to do that can center yourself is to check to make sure you still have all of your kit items.

Navigation Basics

Directional awareness: Your kit comes with a compass, but you may already have a general sense of which way is north. Are you on a trail? Which direction does it generally travel in? Is there a mountain or river nearby that can help you orient yourself? Remember the sun rises in the east and sets in the west. At night, you can look for the north star (see figure to right) to determine the general direction of north. If you feel utterly lost, stop and take action to regain your bearings. Your compass and map are the tools you need to get back on track.

Get out your compass: Your compass will help bring clarity to your situation. It is important to keep a few things in mind when using a compass. Use the compass diagram to the right as a reference while you read through these instructions (it may not look exactly like your compass, but it all compasses have the same main parts), and follow the below guidelines:

- Hold the compass about waist high and level in front of the body
- Magnetic fields from large metal objects or power lines will cause your compass to give incorrect readings, so move away from them when using the compass
- When following a bearing, follow the direction of travel arrow, not the orienting arrow (easy mistake to make!). Guidance on finding and following a bearing is on the next page.



What is declination?

"True north" is the north pole, but your compass points to **magnetic north**, a location in northern Canada that moves slightly each year. Maps, however, are oriented to **true north**. The difference between the two is called **declination**. In general, the declination in populated areas of the world is between 0° to 30° east or west.

Why pay attention to declination? Because you want to orient your map to true north, so all the geographic features on the map align with what you see when you look up.

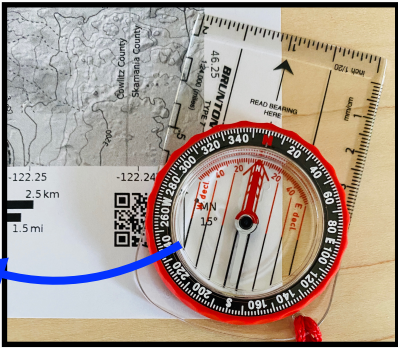
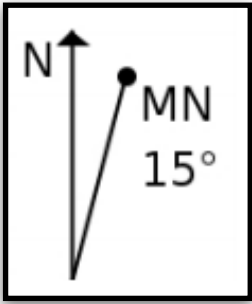
Below are two different ways to adjust for declination:

Option 1: When you place north (or the "N") at the 12 o'clock position on the compass dial and then turn your body until the magnetic needle falls within the orienting arrow, you are facing magnetic north. To find true north, you would need to turn slightly to the left or right (unless you are in an area with 0° declination). How much to turn? That depends on the amount of declination for your part of the world. Fortunately, the exact magnetic declination for your area is usually printed right on your map. If you don't see it on your map, you can refer to the chart on the bottom left. Also, here are the magnetic declinations for a few cities across the United States:

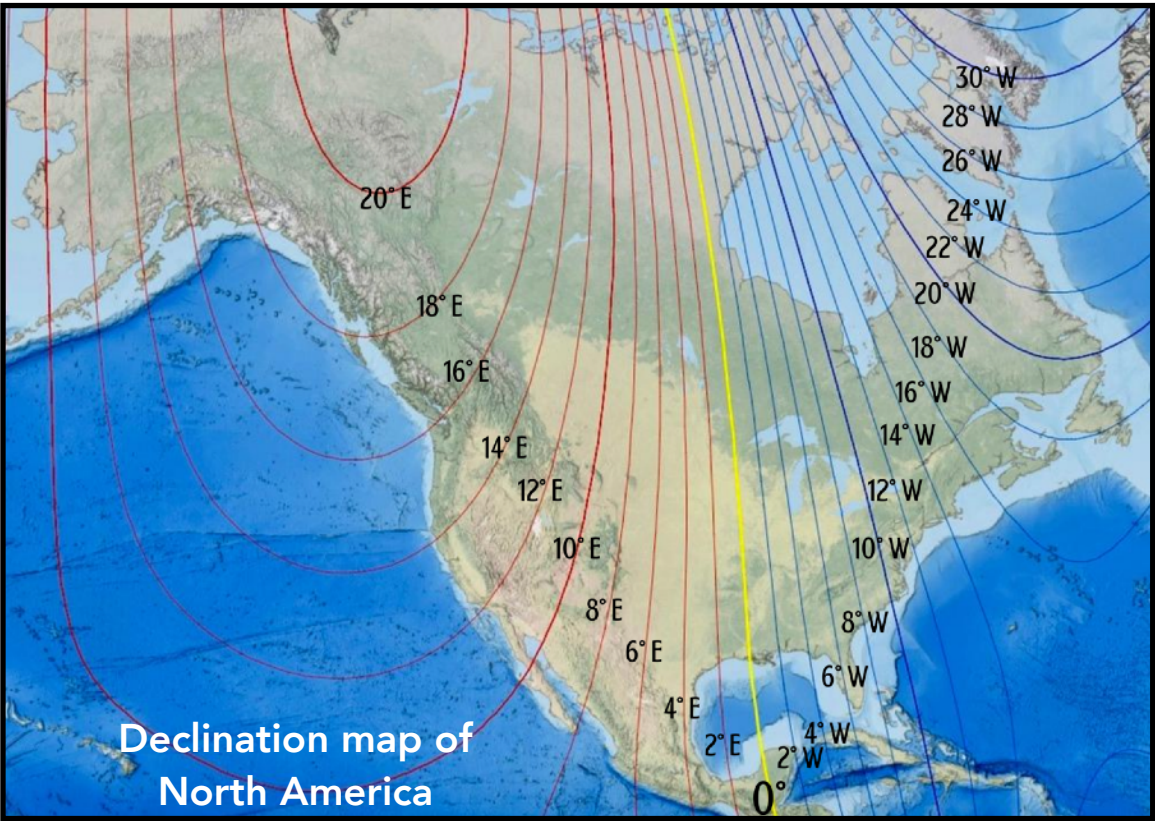
- San Francisco: 13° East
- Dallas: 3° East
- New York City: 13° West

Which way do you turn? If your declination is East, then you turn to the left until the red magnetic needle points to degree number corresponding with your declination. In San Francisco, for instance, the floating magnetic needle would point to 13°. If your declination is West, then you turn to the right until the red magnetic needle points to degree number corresponding to the difference of 360° minus your declination. In New York City, for instance, floating magnetic needle would point to 347°. After you have turned the right amount, you would be facing true north. Looking at your compass, your direction of travel arrow would be pointing to true north, with the floating magnetic needle pointing slight to the left or right (because that needle always points to magnetic north).

Option 2: Your map may have a declination scale to help you orient your map to true north (example below). To use it, start by ensuring you have the "N" in the 12 o'clock position on your compass. Then put the orienting lines on your compass right over the top of the magnetic north (MN) indicator. Now turn the map and compass together until the floating magnetic needle falls within the printed red orienting arrow. Your compass may not align perfectly with the edges of the map— that's normal (the example below has a declination of 15° east).



Be advised: Some compasses are pre-adjusted for declination. You would likely know if yours was pre-adjusted, but if you don't know, look to see if the printed red orienting arrow points directly at "N" (for north). If it points slightly to the left or right of "N," then your compass has been adjusted for declination and you don't need to use the options above.



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Now that you know more about your compass and declination, you are ready to figure out where you are, identify a possible safe location on the map, and if needed plan your route of travel there. You will do this in five steps:

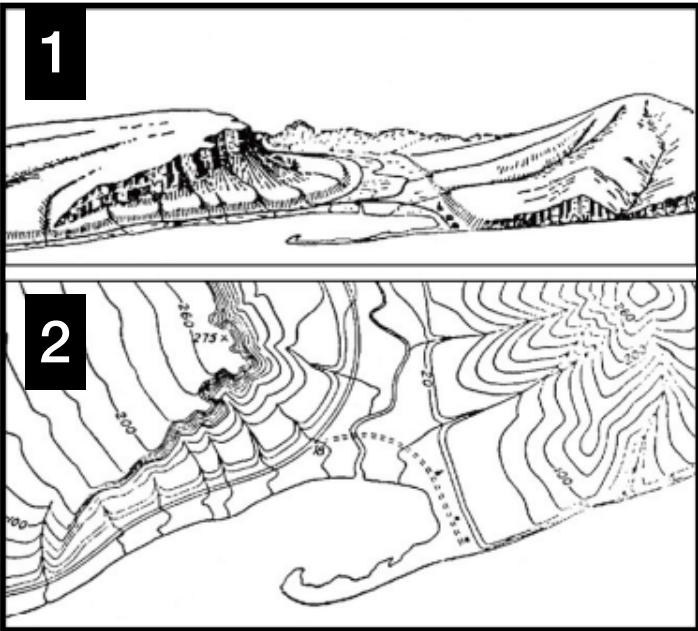
- ✓ **Step 1:** Orient your map to true north and determine where you are
- ✓ **Step 2:** Determine if there is a safe location you can travel to
- ✓ **Step 3:** Decide whether you should stay or move
- ✓ **Step 4:** Find the bearing (or direction) you need to travel
- ✓ **Step 5:** Use your compass to stay on the correct bearing

Get prepared for movement

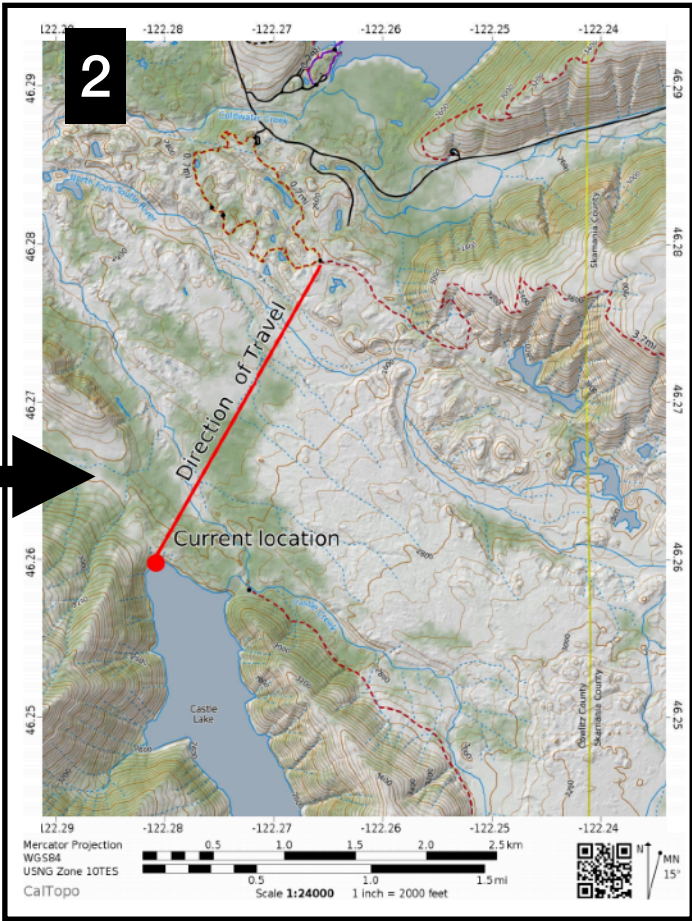
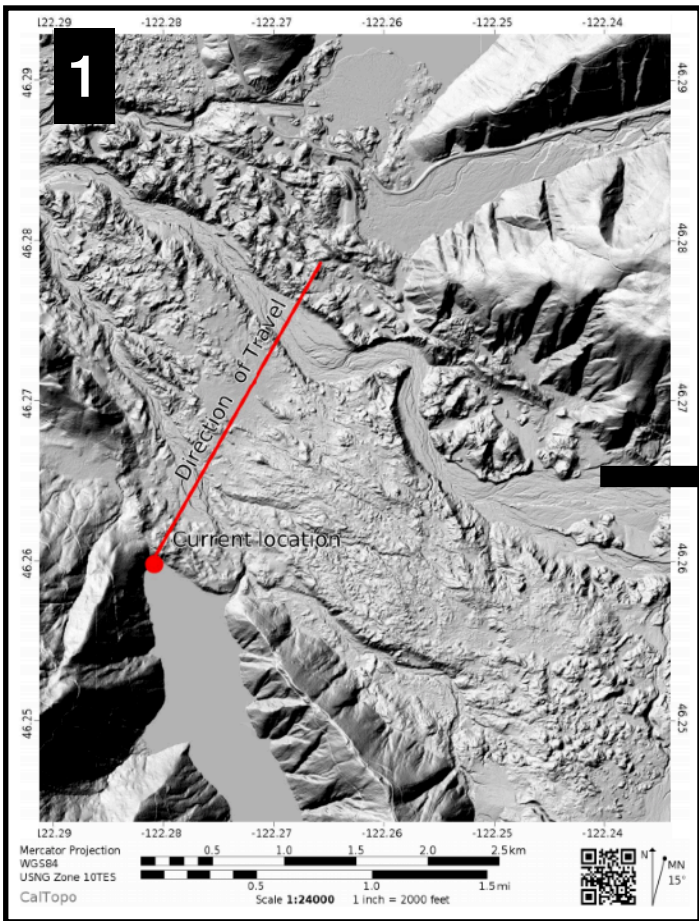
- ➔ Locate your map, compass, pencil or pen, and small notebook
- ➔ Organize your remaining items so they will be easy to carry
- ➔ If you are moving through heavy brush, wear long sleeves, gloves, and eye protection
- ➔ Plan how to keep your map and compass secure when moving - it can be easy to drop them!

Step 1: Orient your compass to true north and determine where you are: Get out your map and prepare to lay it on a flat surface. The ground is just fine! Turn your compass' bezel until north (or the "N") is at the 12 o'clock position. Remember the 12 o'clock position on the compass is where the direction of travel arrow points. Use Option 1 or Option 2 on the previous page to orient your map to true north. Either option will ensure you adjust for declination.

Step 2: Determine if there is a safe location you can travel to: Now that your map is oriented to true north, it should make a lot more sense when you look from the map to the terrain around you. Does anything stand out? Maybe a tall mountain, distinct ridge, creek, river, pond, etc? After surveying your surroundings, take another look at your map. A topographic map shows you terrain features. If you're unfamiliar with topographic maps, look at the small contour lines throughout the map. These show elevation changes. When they are close together, the slope will be steep. When they are far apart, the terrain flattens out. Steep mountains or hills often look like areas of tight circles, sometimes with an "X" to mark the peak. See the maps below for some examples. You might be able to determine where you are by studying the terrain formations around you, then referencing the map (as long as the map is still oriented north!). For example, you might be standing on the north end of a lake with a relatively flat area rising to a steep ridge to your Northeast (as in the map examples below). Based this information, you might be able to locate this lake on your map. It's important to use distinct landmarks like bodies of water or tall mountains. Distant roads can also be useful if you can see them. For instance, if you look south and see a long road east to west, you can look for that road on the map. Then you know that you are somewhere to the north of it. Perhaps an additional landmark (tall ridge, marsh, etc) near your location will then help you zero in on your area.



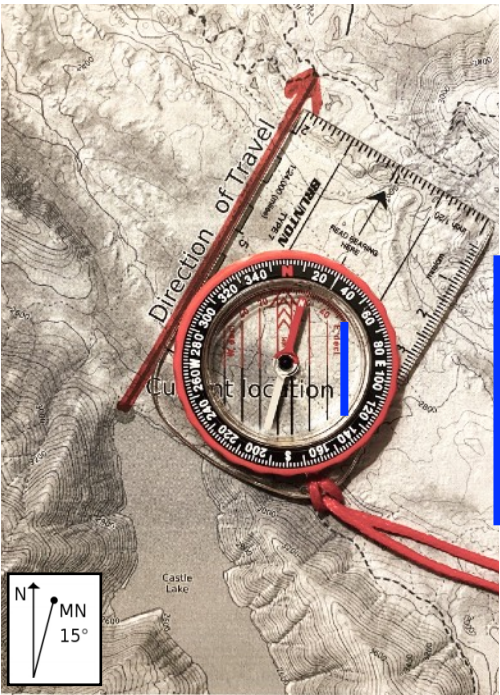
Examples of contour lines. The first image gives a visual depiction of the terrain. The second images show how this terrain is translated into contour lines. The images to the right include a direction of travel arrow that applies to the example in the next section on finding a bearing.



Step 3: Decide whether you should stay or move: This can be a tough decision, but only you know all the details of your situation. While it's generally better to stay put and signal for help, some situations necessitate movement, such as an urgent medical situation. If you do move, try to stay on trails. You can move faster on a trail and are more likely to encounter a friendly hiker who can help you. Leaving the main trail or planned route probably means overland bushwacking, and that is extremely hard in the backcountry. However, you may need to bushwhack if it means reaching a logging road that you absolutely know is just a couple hundred meters through the brush. But remember that once you are off route, you should follow a bearing on a your compass and keep track of your movements. If you lose sight of prominent landmarks and don't have notes on your direction of travel, you can become disoriented very quickly. This is especially risky in areas of flat forest where it is hard to see the horizon and everything looks the same. Also keep in mind that it is common for lost individuals bushwacking through forest to walk in a circular direction even though they think they are going straight. Using your compass will help prevent this from happening.

Step 4: Find the bearing (or direction) you need to travel: Is there a possible place of safety nearby? Maybe a road intersection, town, or campground?. If you know where you are and where you want to go, you can use your map and compass to find a bearing that will get you to your destination. Here is how to do it:

- Ensure your your map is oriented to true north
- Draw a line between your location and your destination
- Line one edge of your compass along the line you drew. Make sure the direction of travel arrow is pointed the way you will travel.
- Without moving the map or the compass body, turn the compass bezel (outer ring) until the compass' orienting lines parallel the north-south lines of the map
- The bearing that will get you to your destination is revealed at the 12 o'clock position of the dial. The bearing reading for the example to the right is 28°. This is your **true bearing**, meaning it aligns with true north. Remember though, your compass points to magnetic north. So unless your compass is pre-adjusted for declination (see previous page for how to tell), then you will need to adjust your bearing to account for the magnetic declination.



Finding a bearing: The north-south line (or edge of map) should parallel the orienting lines on compass. The blue lines serve to highlight how these parallel. In this example, the bearing for the direction of travel is 28°.

How to account for declination when calculating your bearing

Look at your map to find the declination (the example above shows a declination of 15° East). If your declination is East, the you subtract your declination from the true bearing. So if our true bearing is 28° and our magnetic declination 15° East, we would calculate $28^\circ - 15^\circ = 13^\circ$. The bearing we would follow is 13°. If our declination was West, we would add the declination to the true bearing. Remember the phrase "East is least and West is best" to help you adjust correctly.

Step 5: Use your compass to stay on the correct bearing: Now that you know what bearing you need to follow, turn the bezel until your bearing is at the index line. Hold the compass flat in front of your body, about waist high. Turn your body until the red magnetic needle falls in the red orienting arrow. The direction of travel arrow is now pointing you along your bearing line, which is the direction you want to move. To make it easier to travel along your bearing line, you can look for a distinct landmark along your intended path and walk towards it (look for something a few hundred yards away or less). Once you arrive at that landmark, reference your compass, align to your bearing, and choose another distinct landmark along your path of travel, and walk to it. Do this until you reach your intended destination. It's a good idea to check your map frequently, taking note of the features around you. If you hit an unplanned barrier (river, lake, cliff, etc), take your time to review your map and doublecheck your location. Try to stay aware of how far you are traveling. Counting steps can be helpful. It is also a good idea to keep notes on your route so that you can backtrack if needed.