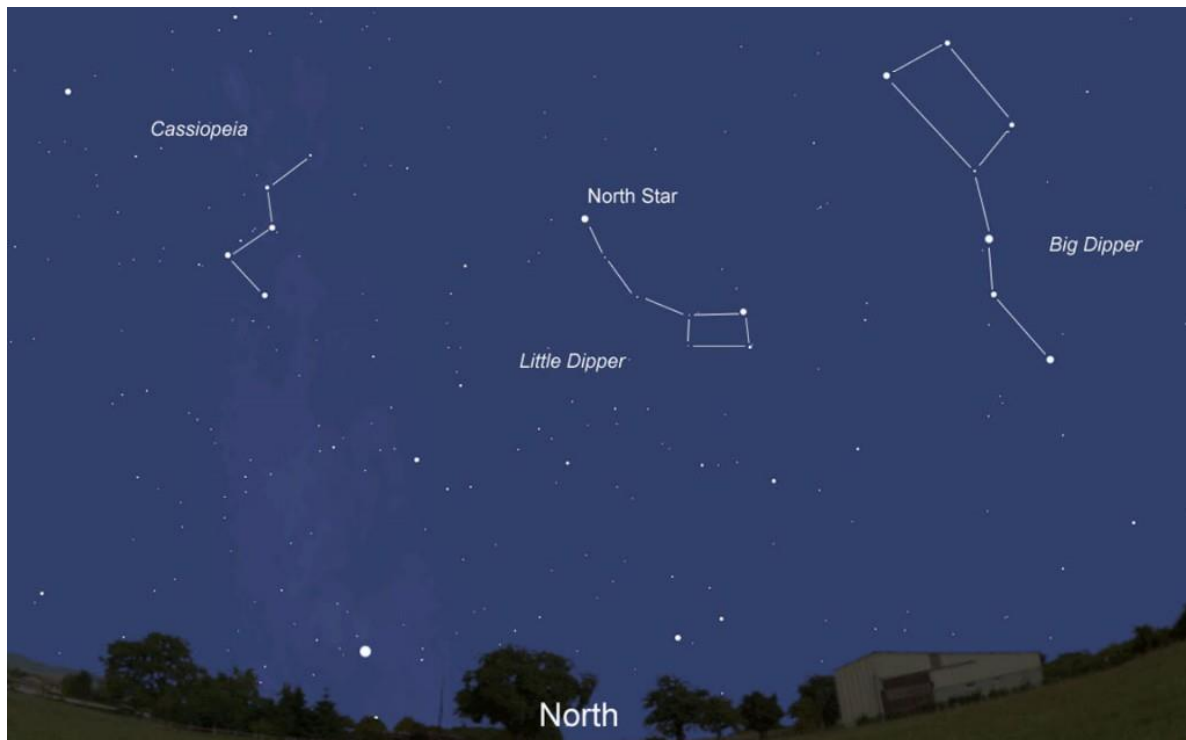


## Using the Stars for Wilderness Navigation



You can locate the North Star (Polaris) using the **Big Dipper**, **Cassiopeia**, and the **Little Dipper**.

If you're fortunate enough to have visible stars above you, you can navigate accurately during the nighttime hours.

These constellations never set which means that if you have a clear night, you can use these constellations to locate Polaris and locate true North consistently.

The Big Dipper and Cassiopeia are located directly opposite each other and rotate counterclockwise around Polaris. The two stars forming the outer lip of the Big Dipper are known as "pointer stars" because if you draw an imaginary line through them and continue approximately 5 times the distance between the pointer stars, you will find Polaris.

**Cassiopeia has five stars that form a "W" shape on its side. Polaris is straight out from Cassiopeia's center star.**

The reason you should use both is because Polaris actually forms part of the handle of the Little Dipper and relying on both means you will not accidentally confuse the Big and Little Dipper constellations.

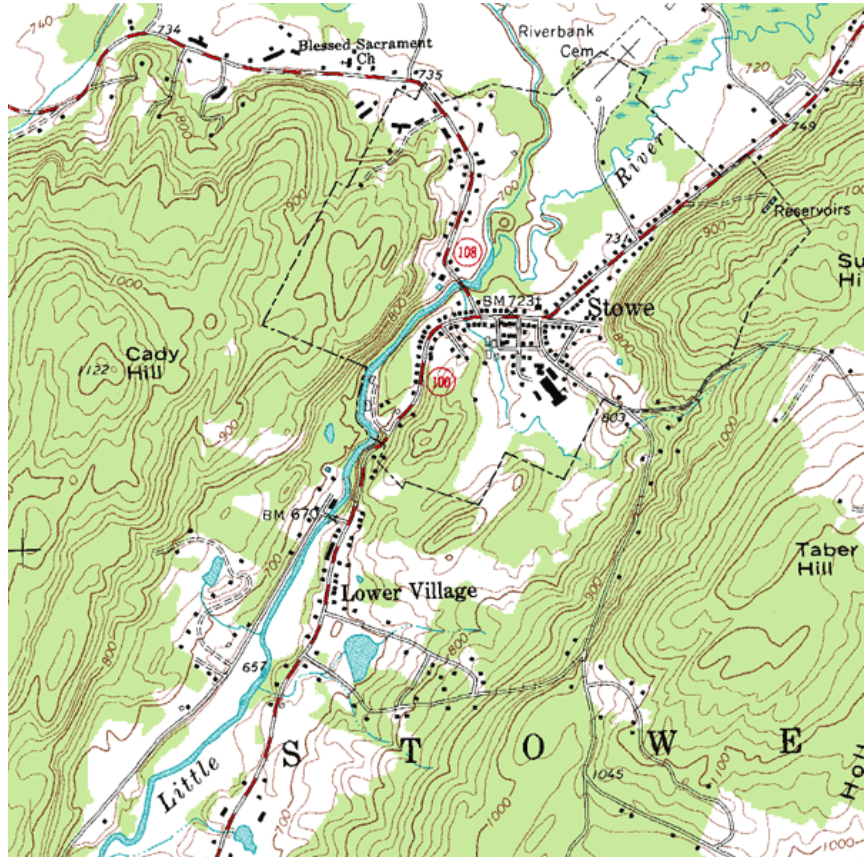
Once you have successfully located the North Star, draw an imaginary line directly to earth – this is true North.

## Map Reading

### Topographic

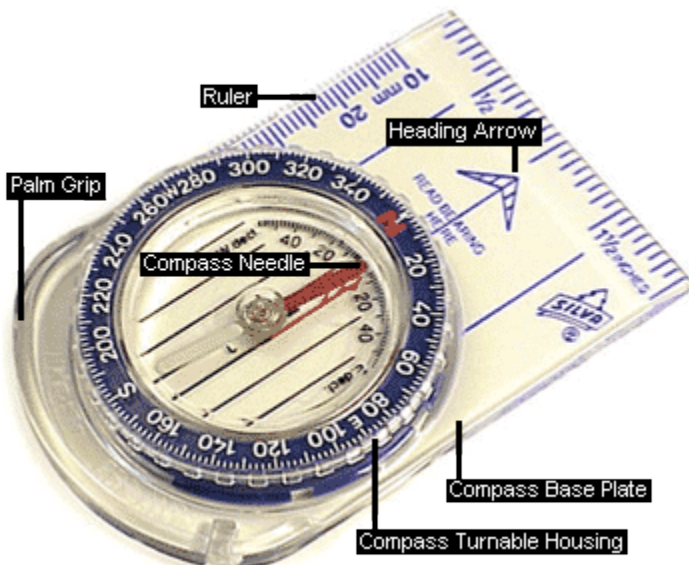
When reading a topographic map, there are a couple of things you should remember about the contour lines. (Watch the video – it's quite good: <http://sectionhiker.com/how-to-read-a-topographic-map/>)

1. Every point of the same contour line has the same elevation.
2. One side of a contour line is uphill and one is downhill.
3. Contour lines close to form a circle (or run off the side of the map). The area inside the circle is almost always higher than the contour line.
4. Contour lines are drawn close together on steep ground and farther apart on flat ground.
5. Contour lines form a V patterns when they cross a river or stream valley. The tip of the V always points uphill and the other direction that looks like a "frown, points down." I use that phrase to help me remember this.



### Compass Parts:

- **Compass Needle:** This arrow will always point to the Magnetic North. This will be outlined later in more detail. Often the compass needle is painted red so you do not mistake the north arrow for the south arrow.
- **Heading Arrow:** This arrow is fixed on the base plate and it should point in the direction that you are going. So when you hold a **navigation compass**, always make sure this arrow is pointed towards your destination.



- **Turnable Housing:** This top part of the Compass holds the basic directions (north, east, south, and west) and the degrees. As we will see later on, this housing is turnable so you can adjust your bearing to the magnetic north.
- **Base Plate and Grip:** The base plate often has a ruler that can be used in combination with your topographical map for determining distances and triangulating your position. The end is often shaped to form a palm grip with the Heading Arrow pointing in the direction that you are going.

## **Compass Use:**

### **Calibrating your Compass for Magnetic Declination**

Different areas on the globe have a different magnetic declination which is basically the difference between magnetic north (where your Compass will point to) and true north (the direction where north really is). There is a difference because the magnetic north pole lies about 1000 miles below the true north pole. So the declination differs per location on the globe. In general, the further north you go, the bigger the declination becomes. The magnetic declination of the area you are in can often be found on [hiking maps](#) or can be asked from local authorities. You will need to adjust your Compass to take the magnetic declination of your area into account. This is how you do this using a map:

- Get your topographical map and find the Magnetic Declination Information. Most of the time, it will give you two arrows - one signifying True North and one is for Magnetic North. Often you can also find the declination in degrees.
- Place your Compass on your map. If there are arrows, then make sure to place the Heading Arrow along the True North line and turn the Compass Housing until it aligns with the Magnetic North line. Now turn your map until the Compass is pointing North along the Magnetic North line.
- Your map is now aligned to True North.

### **Orientation: Determining your Location on the Map**

You can use your map and Compass to determine your exact location on the map by triangulating:

- Take an initial bearing on a recognizable landmark and draw a line from it through and beyond your estimated position.
- Identify a second landmark that is at least 45 degrees away from your first landmark and draw a second line.
- Your position is where both lines intersect. For a more accurate determination, use a third or even fourth landmark bearing to verify your location.

### **Navigation: Plot a Course using your Compass**

Once you have determined your location, you can use your Compass to keep on a certain bearing:

- Place the Compass Base on your map with the Heading Arrow along the line on your map that you want to follow.
- Rotate the Compass Housing until the Compass Needle and the North Line on the Compass Housing line up.
- The Heading Arrow will now show you the correct direction and as long as you keep the Compass Needle and the North Line on the Compass Housing lined up, you will be going in the right direction.

## GPS

### Step 1

Prepare your GPS unit before you leave. Make sure your GPS has fresh batteries. GPS devices quickly exhaust batteries, so always pack spares. If you have access to them, upload topo maps for your hike area. Also, obtain a good map of the area that is waterproof, if possible.

### Step 2

Navigate while hiking. If you installed detailed topographic maps on your GPS unit, navigating is a cinch since you can zoom in and out to see exactly where on the map you are.

### Step 3

Use your GPS coordinates to find out exactly where you are, even if you don't have a good map installed on your unit. Most topo maps include latitude and longitude information along the sides and most use units of degrees, minutes, seconds. Just compare the coordinates given on your GPS unit to those along the sides of your map to find out where you are. Make sure you are getting a strong satellite signal to ensure accurate navigation.

### Step 4

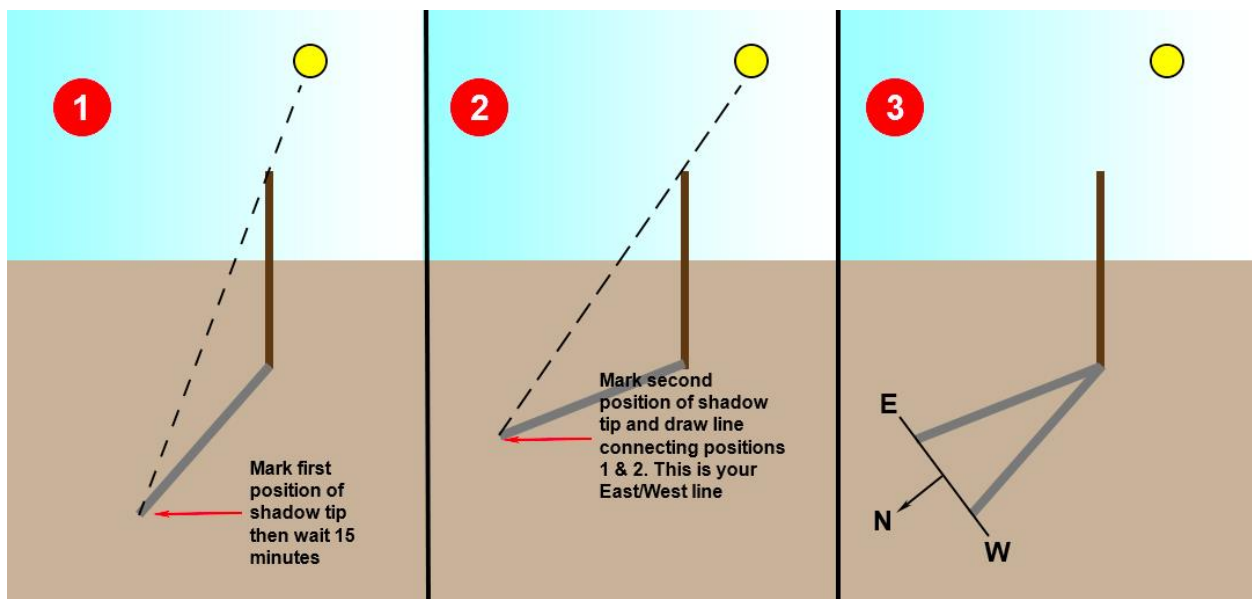
Verify your location using landmarks. GPS units usually have a compass feature. Once you've determined your location on the map, use the compass feature to check landmarks to make double sure of your location. For example, if the map shows a mountain to the north of your location and a large river just to the east, use the compass and look around to make sure that is the case.

### Step 5

Check your location every hour or two to make sure you are track. Water breaks, snack breaks and catch-your-breath breaks are all good times to make sure you are where you think you are. The longer you wait between checks, the longer you have to backtrack if you make a mistake.

### Tips & Warnings

- Setting your GPS to the same units as your map can help make navigating by GPS much easier.
- Towering rock walls or dense forest canopy can weaken your signal reception. Move to an open area if you have trouble getting an accurate location reading.
- Bring extra batteries and a compass just in case.



## **Other Methods:**

### **Shadow Tip Method**

To get your bearings using this method, find a straight stick approximately 3 feet long. Look for a level spot that is relatively free from brush where the stick will be able to cast a definite shadow.

1. Place the stick into the ground and mark the tip of the shadow with a stone, a twig, or simply a mark in the ground. This mark represents West, no matter where you are in the world.
2. Wait approximately 10 – 15 minutes until the tip of the shadow has moved slightly. Mark the tip of the shadow at this point as well.
3. Draw a straight line through the two marks – this is an approximate East-West line.
4. By standing with the first mark on your left side and the second mark on your right, you are facing North.

Although the [shadow tip method](#) is not 100% accurate, it is useful anywhere in the world and is a quick way to get an approximate orientation.

### **References**

- Making a Star Finder lesson
  - o <http://www.dennisschatz.org/activities/Star%20Finder.pdf>
- Basic navigation tools and skills
  - o <http://survivalist101.com/tutorials/outdoor-skills-101/wilderness-navigation/>
- Compass and Map
  - o <https://www.rei.com/learn/expert-advice/navigation-basics.html> (Compass use and top maps)
  - o <http://sectionhiker.com/how-to-read-a-topographic-map/> (Topo map video)
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  - o [http://www.trails.com/how\\_1005\\_use-gps-navigate-hiking.html](http://www.trails.com/how_1005_use-gps-navigate-hiking.html)
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