

Prepare to get OFF the trail - Intro to Topographic Maps

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You've exhausted the supply of clearly marked trails in your little corner of the world and grown beyond the confines of traditional campground camping. Or perhaps you've already ventured into the wilderness in the company of more experienced backpackers, and now you're ready to begin planning your own itineraries. Whatever the reason, once you make the decision to step off the well beaten path, you need to learn to read and use topographic maps.

So what is a topographic map, and how does it differ from other kinds of maps? The Random House Unabridged Dictionary defines topography, in part, as "the relief features or surface configuration of an area." In essence, a topographic map is a detailed rendering of particular region, which provides the backpacker with everything you need to know in order to plan and navigate your intended journey, including elevations, terrain changes, potential water sources and physical structures, like homes, bridges and impassable fencing. If you encounter an emergency during your trip, a topographic map will help you determine the nearest roads and houses, as well as the safest routes out of the wilderness.

Do you really need one? If you plan to venture beyond well marked trails and roadside campgrounds, the answer is an emphatic "Yes!" Ask any seasoned park ranger, and he or she probably remembers at least one hapless hiker who got lost and eventually perished within any easy walk of a public road or building. And then there are the campers who must be rescued each year because they walked in into the wilderness without the tools or knowledge to find their way home again. A topographic map is as vital a piece of your camping gear as your backpack or utility knife. It will help you get to where you want to go and back again, and alert you to potential challenges and hazards along the way.

CHOOSING THE RIGHT MAP

When it comes to topographic maps, newer is definitely better. A map that is even five years old can potentially be misleading if new buildings have been constructed, water sources diverted, or roads extended. Natural events, like flood, fire and landslide activity, can alter the topography of an area dramatically. So while those 30-year-old maps you unearthed in your parents' attic may have a satisfyingly vintage feeling about them, you're better off displaying such pieces of history under glass than actually attempting to navigate with them. If you're unsure how old your map is, the publication date generally appears at the bottom left hand corner. Current topographic maps can be obtained from a variety of sources, including the US Geographical Survey (www.usgs.gov/pubprod/maps.html) and Trails.com. You should also print out a copy of the USGS "topographic Map Symbols" guide, which can be downloaded at <http://erg.usgs.gov/isb/pubs/publists/booklets.html>. This guide provides a more detailed description of the lines and symbols used than you'll find on a standard map's legend.

topographic maps come in different scales (map distance versus actual distance), and it's important that you choose a map appropriate to your needs. As a backpacker, you will most likely use a 7.5 minute map, which covers 7.5 minutes of longitude and 7.5 minutes of latitude. Estimating a minute to be approximately 1.2 miles (be aware that longitude

minutes shrink as they move further away from the equator, while latitude minutes remain constant), a 7.5 minute map would cover approximately 81 square miles. While 7.5 minute maps present the highest level of detail, 15 minute maps are also available. Other scales of topographic maps are also sold, but they aren't particularly useful for hiking and camping.

If your map doesn't cover your entire route, you can identify the supplementary maps you'll need by checking the corners of your primary map. Similar to the way a Thomas Guide works with roads, the adjacent map title is printed on each corner. Using several 7.5 minute maps will likely be more effective than choosing a single 15 minute map that covers the entire route on a less detailed scale.

READING YOUR MAP

A topographic map contains so much data that it can seem overwhelming at first. However, it's actually fairly straightforward once you understand the map's main components. When you first open your map, you should make note of the "magnetic north declination" graph located in the lower left hand corner. This graph shows true north in relation to the map, as well as the deviation of magnetic north in both degrees and miles. For example, if the graph indicates that magnetic north is 13.5 degrees east of true north, you know that you need to compensate 13.5 degrees westward from your compass reading to find true north. If you plan to use the map's UTM grid, rather than longitude and latitude, the graph also notes any deviation between the grid and true north.

What's a UTM? Universal Transverse Mercator (Try saying that three times fast!) is an alternative to longitude and latitude. If you served in the military you may have come across it before. UTM divides the globe into a grid, with horizontal numbers and vertical letters to designate each zone on the grid. For example, New York City is found in UTM zone 18N. Within a given zone, locations are designated in terms of meters north and meters east (a meter is 3.281 feet). While you will most likely be using longitude and latitude, it's a good idea to understand the basics of UTM so that you will have an alternative way to orient yourself if you lose your bearings.

Longitude degrees and minutes are identified in each corner of the map, and at regular intervals along the edge. UTM designations are the smaller, emboldened numbers found between the degree and minute measurements. A UTM notation 3902000 N refers to 3,902,000 meters north.

Your map's scale can be found at the bottom center of the map. Since the distance between longitude lines changes as you move away from the equator, the scale will help you measure distances in your specific area. The scale is presented both numerically and graphically. For example, if your map shows the figure 1:250,000, then 1 inch on the map equals 250,000 inches of land, or roughly four miles (63,360 inches make up a mile). Immediately below the figure, a horizontal line visually depicts the same information.

Unless your map represents a very flat area, you will likely notice that the area is covered with brown wavy lines that represent natural features, like mountains and gorges. These are contour lines, and you can use them to help determine the steepness of your planned route. Each line traces a single level of elevation. The distance between two lines represents an elevation change according to the map's particular scale. So an area in which the contour lines are spaced far apart will be relatively flat, while many close contour lines represent

rapid changes in elevation. The contour interval is listed just below your map's scale. If your contour interval is identified as 30 feet, you know that the space between two contour lines represents a 30-foot change in elevation, either up or down. Since contour lines can become quite tightly packed on mountains and other steep grades, specific elevations are noted along certain "index" contour lines, which are a darker shade of brown than regular lines. As an example, a 5000 index notation would indicate an elevation of 5,000 feet or meters above sea level, depending on your map's contour interval scale.

The USGS "topographic Map Symbols" guide contains a listing of common features and their map designations. What you find on your map will depend on the area, but some of the more common identifiers include green shading for vegetation, blue for water, and red or gray for densely populated areas. There are symbols to designate natural features, like rivers and permanent snow fields, as well as man-made structures, like railroad tracks, fencing and mine shaft openings. Take some time to familiarize yourself with the features of the area you plan to explore, identifying water sources, obstacles and off-limit sections of land. Once you have a general sense of your intended surroundings, you're ready to begin using the map to plan your trip.

PLOTTING THE ROUTE

Once you've identified your ultimate destination, your next step is to use the map to plan an accessible route that is within your physical capabilities. If you are using a USGS-USDA Forest Service Single-Edition Quadrangle map, established trail heads will be marked clearly with a red TH symbol. Otherwise, you'll need to find an entry point that is accessible by public road and close to an available parking area. Chart a course that will keep you within range of usable water supplies and away from insurmountable obstacles. If this is your first expedition without a more experienced partner, you may want to stay reasonably close to previously marked trails and well-traveled roads, so that you can easily reach assistance if you run into trouble. As you become more adept at navigating, you can venture further and further into the wilderness.

Take seasonal changes into consideration as you read your map. A stream that is designated as intermittent can be reasonably counted on in March after the snow melt, but may be completely dried up in midsummer. Swamps and marches may be frozen over and traversable at certain times of year and hazardous or just plain miserable at others.

PREPARING FOR THE HIKE

With your route plotted, you should now use your map to pack and ready yourself. Once you are within a week or two of the trip, contact the relevant state or local forestry service to find out if there any terrain changes you need to be aware of, like trails that have been washed away since the most recent map was published. Remember, these are the people who like likely have to come in and rescue you if you run into trouble, so listen to their advice and revise your route to avoid any areas they feel are currently unsafe.

If you are planning an extended or particularly intense trip, you may want to organize a training regimen based on the terrain identified by your map. For example, if you will be traveling through marshland, jogging on the beach with a light pack can aid you in building up the appropriate leg muscles. If your route entails steep inclines, you may want to brush up on your climbing skills during a few smaller day trips. You should also use your map to

determine the altitudes you will be traveling through and to determine whether thinning air will be a factor in your journey.

Even a relatively mild altitude of 6,000 feet above sea level can impact some people, so you don't need to be climbing Mount McKinley for altitude to affect your progress. Higher altitudes mean less oxygen in the air, which can alter your endurance, circulation, and breathing. If you plan to travel higher than 8,000 feet above sea level, you should familiarize yourself with techniques for hiking in high altitudes and the symptoms of Acute Mountain Sickness. As a rule of thumb, your campsite should be no more than 1,500 feet higher than the previous night's campsite in order to facilitate steady, safe acclimation. You should also expect to travel more slowly during the day, since it's easy to overexert yourself in thinner air. Prior to the trip, integrate interval training into your fitness program, alternating controlled jogging with shorter intense sprints.

Use your map to help you pack appropriately for your journey. While you should research the general weather conditions in your area, your topographic map will help to further refine your supply list. For example, changes in altitude generally mean a corresponding rise or drop in temperature, and denuded areas signify greater exposure to elements, like wind and sun. If you expect to ford a stream or navigate marshy terrain, you'll need appropriate footwear, and you might choose to bring a walking pole if you anticipate rocky surfaces. Additionally, based on the relative strenuousness of your trip, you may need to cap the weight of your pack, or make plans to establish a base camp where you can leave a majority of your heavier supplies. As a final safety measure, you should use your map to leave an explicit description of your intended route, including major trail markers, with a friend or relative, so that you can be more readily located should you become lost or stranded.

USING YOUR MAP EN ROUTE

Throughout your trip, you'll use your topographic map, along with a compass, pencil, and clear 180 degree protractor-ruler in order to keep yourself on course. As soon as you reach your trail head, find a vantage point from which you can easily see two or three distant landmarks, like mountains or distinct rock formations. Then use triangulation to orient yourself and your map.

1. Adjust the declination (difference between magnetic north and true north) on your compass in accordance with the declination graph in the lower left hand corner of your map. This is generally done by turning a screw or key on your compass to change where the orienting arrow (the red area where you line up the compass needle to take a reading) sits in relation to due north. For example, if your map has a declination of 13.5 degrees west, then you'll compensate by adjusting the orienting arrow to 13.5 degrees east of true north.
2. Orient your map on a flat surface so that it faces true north as indicated by your newly adjusted compass. Remember that true north is where the orienting arrow is, which, using the example in step one, will be 13.5 degrees away from the N on the outer ring.
3. Take a bearing of your first landmark by pointing your compass needle at the landmark, and then rotating the dial to line the needle up with your orientation arrow.

4. Using your protractor-ruler, draw a line on your map that runs through the landmark at the same bearing. As an example, if your bearing read 8 degrees west of true north, you would draw a line that was turned 8 degrees west from the map's north-south meridians. Repeat this step with each of the other landmarks.

5. Check the point where the lines intersect. If you have triangulated your location correctly, this point should be your trail head. If your lines do not intersect or they intersect somewhere other than your trail head, then retake your bearings and try again.

Once you've gotten the hang of triangulation, you're ready to go. Use your compass, protractor and map to triangulate your location at regular intervals, so you'll know quickly if you have gotten off track. If you are following an established trail, be aware that hiking trails are generally the least accurate aspects of any map, owing to changes caused by weather and usage. You may want to triangulate your location more frequently on such a trail to ensure that you really are where you intended to be.

Throughout the trip, take some time to periodically orient yourself to roads and structures in your vicinity. You'll be better placed to cope with an emergency, such as illness or injury, if you already have a general idea of what your nearest options are. Additionally, you should be particularly careful when passing close to restricted or dangerous areas. By triangulating your location more frequently, you can avoid any unfortunate mishaps that might come with straying too far off your route.

Mastering the use of a topographic map is akin to graduating from a learner's permit to an unrestricted driver's license. Rather than being bound to routes and campsites already well trampled by your peers, you'll have the freedom to take full control of your journey and explore the full beauty of the wilderness around you. With a little patience and practice, you'll be tramping through the woods and backcountry like a pro!

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