

LAND NAVIGATION, COMPASS SKILLS & ORIENTEERING = PATHFINDING

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1 LAND NAVIGATION, COMPASS SKILLS & ORIENTEERING



1.1 FIRST AID

Be familiar with first aid for the types of injuries possible when hiking and orienteering: cuts, scratches, blisters, heat & cold reactions (sunburn, heatstroke, heat exhaustion, hypothermia, dehydration), as well as snakebite, insect stings, tick bites, and contact with poisonous plants.

1.2 MAKE A PLAN – LEAVE A NOTE

Boy Scouts are advised to “plan your hike & hike your plan”.

Have proper equipment & footwear for your trek.

Know the current and forecast weather.

Have a map for your area as well as a compass and GPS (if applicable).

Let someone else know of your planned route, time of departure & return,

Leave a copy of this information with someone not on your trek & also a copy in your car.

1.3 WHERE ARE YOU NOW & WHERE DO YOU WANT TO GO?

With practice and the use of clear principles, you can develop the ability to keep track of where you are and to find your way to where you want to go. Later we will discuss strategy for what to do if you lose your way.

For now, know that the basic factors involve:

- Selecting an objective.

- Ascertaining your present location, so that you can determine the direction and distance to your objective.

- Orienting yourself to that direction.

- Traveling by the best route to the chosen objective.

In other words:

- Where do I want to go?
- Where am I?
- How do I get where I want to go?
- Which way is it?
- What’s the best route?**

1.4 WHAT’S IN A NAME?

What name should be given to that skill which enables you to find your way to where you want to go?

ORIENTEERING is part of the Boy Scout vocabulary and, by definition; orienteering is a cross-country race in which participants use a highly detailed map and a compass to navigate their way between checkpoints along an unfamiliar course.

ORIENTEERING can be an exciting sport for everyone in a patrol or troop. Teams of Scouts can go together to complete the course quickly and accurately, combining map and compass ability with route finding, observation and physical fitness.

‘LAND NAVIGATION’ and ‘PATHFINDING’ are more descriptive of the basic skills used to find one’s way in the outdoors under normal as well as emergency conditions. ORIENTEERING is THE more formal and competitive sport use of these skills.

1.5 LOOK AROUND – WHAT DO YOU SEE?

IF you spend unhurried time looking at the scenery around you, you will begin to see specific features of the land – the hills, river, wooded areas, open areas, roads, a mountain, or a tower, **the shape of the land...hilly, flat, rocky, mountainous and so on.** Much of learning your way will depend on your skills of observation.

A map is a view from above. Of course, we are not soaring above the land, so our land-based perspective limits our view. Something that appears prominent on the map may be obscured because you see only the portion of the land that is towards you.

With good visibility, and if you can identify several landmarks, generally you can line up your map without a compass. Sighting across landmarks on the map to correspond with the landmarks on **the terrain is called ‘orienting by visual inspection’.** This connects hikers to their surroundings. The hiker can see his/her place in the larger picture. If you refine this skill and make it a habit to align your map with your surroundings, you will be safer and you will better appreciate your time in the outdoors.

1.6 TOOLS IN THE TOOLBOX

“A trails man is a fellow who knows how to find his way through the wilds. He hikes through forests, over mountains, across desert lands. His best friends are his compass and his map. **They tell him where he is and how to get where he wants to go.”** – Scout Field Book, 1944

TOOLS: MAP & COMPASS, PLUS EYES & EARS, maybe binoculars, possibly GPS.

2. HOW TO USE A COMPASS



2.1 GOOD HIKERS COMPASS

HOW DOES A COMPASS WORK?

The compass is a small tool with few parts. By itself, a compass cannot tell you where you are or what you are looking at, but it CAN indicate direction.

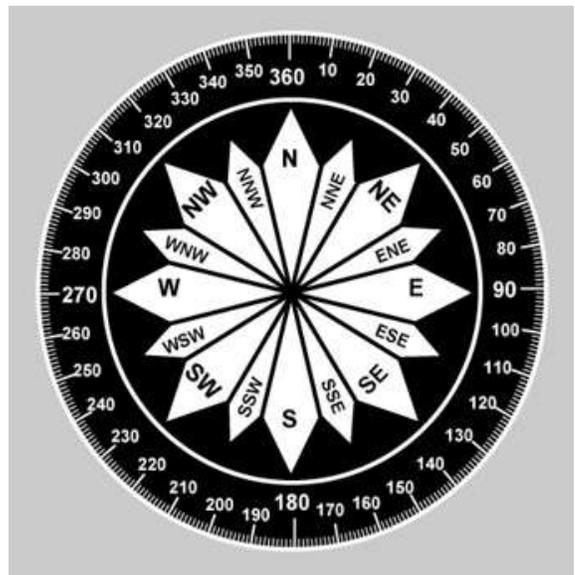
Basically, a compass is a magnet, shaped like a needle, mounted on a pivot. The needle is free to turn in response to the pull of the Earth's magnetic field. A housing protects the needle. Some compasses have other useful, optional features, such as a base plate. IT'S REALLY WORTH IT TO HAVE A DECENT COMPASS, AND IT NEED NOT BE EXPENSIVE – probably around \$20-30.

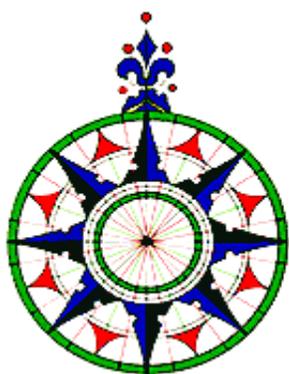
A GOOD HIKER'S COMPASS SHOULD HAVE

- A rotating housing with BOTH cardinal points (N-E-S-W: North East South West) AND degrees (0-60) with degrees marked every 2 degrees
- A liquid dampened needle with a RED 'north' end
- Transparent base plate on which the housing is mounted.
- Direction-of-travel arrow on the base plate (for sighting & following bearings)
- Straight edges that make it easy to measure and plot directions on a map.
- A built in magnifier (useful for seeing small map symbols or other small print)
- A red orienting arrow printed on the bottom of the housing (north end is usually red)

2.2 PARTS OF A COMPASS

(PICTURE HERE – PARTS OF A STANDARD HIKERS COMPASS)





A COMPASS FACE is a circle marked off in degrees from 0 to 360. The circle is measured clockwise beginning at the top (0 degrees – NORTH). One fourth of the way around the circle is an angle of 90 degrees – EAST. SOUTH is located at 180 degrees, exactly half-circle across from NORTH. At 270 degrees is WEST. NORTH – EAST- SOUTH – WEST are called CARDINAL POINTS. – And should be marked on the ‘good hikers compass.’

INTERESTING FACTOID: A COMPASS ROSE appears on many maps as early as the 14th Century. Drawn by an early Portuguese mapmaker, why the first 32-point compass rose has a fleur-de-lis which indicates NORTH and a Cross that indicates EAST to the Holy Land

2.3 HOW TO USE A COMPASS FOR MAXIMUM ACCURACY

- Keep the compass LEVEL. Tilting keeps the needle from swinging freely.
- Hold the compass directly in front of you, not at an angle.
- Directly face the object to which you are measuring the bearing (more about that in a minute).
- To align the magnetic needle and orienting arrow, hold the compass close so that you look DOWN on the face, instead of across it, or sideways at it. This will help be sure that the needle lies exactly straight over the orienting arrow, with the points lined up.

2.4 TAKING A BEARING & FOLLOWING IT

Taking a bearing is measuring a direction from one point on the ground to another.

HOW DO I TAKE A BEARING?

Hold the compass in one hand, directly in front of you. Rotate your body and the compass **(together) until the ‘direction-of-travel’ arrow points in the direction you want to go.**

THEN rotate the bezel on the compass until the NORTH end of the magnetic arrow (usually red) lines up with the NORTH end of the orienting arrow.

READ THE NUMBER on the bezel directly opposite the bearing index. This is the BEARING.

STEPS TO FOLLOWING A BEARING

1. MEASURE THE BEARING. After the bearing is set, do not turn the housing while you are following it.
2. LOOK AHEAD along your line of travel and choose a landmark to keep in sight, and a landmark that you can get to from your starting point. The points available to select will vary depending on vegetation, terrain and weather. LOOK BACK to have a point behind you **as a landmark, in case it’s needed. (More about this later).**
3. Now, WALK DIRECTLY towards your reachable landmark. Watch where you are going, while **looking out for rocks and snakes, still keep your eyes ahead for your landmark. Don’t walk while staring at your compass falling over things.** The landmark keeps you on course
4. When you reach your landmark, VERIFY that you are going in the desired direction. Again, hold the compass in front of you – **don’t touch the housing!** – And turn body & compass together until the north-seeking needle end matches the pointed end of the orienting arrow.

(Show picture of landmarks and intermediate landmarks)



Distant landmark



Intermediate landmark

5. Select another landmark along the bearing line and walk to IT. Repeat the process as often as needed to cover the distance to your desired point.
6. ORIENT YOURSELF WITH THE COMPASS AT EACH LANDMARK TO BE SURE YOU ARE HEADED IN THE RIGHT DIRECTION FOR THE NEXT LEG. Reason: when traveling on any hill or incline, the body tends to want to travel downhill, even if slightly. Trust your compass to verify your bearing and course.
7. If extended visibility is difficult, you and your hiking partner can establish each other as “portable landmarks” verifying and adjusting position based on compass bearing.
8. Stay on your bearing by ‘back sighting’

Note and take a bearing on a landmark ahead of you, take a bearing on a landmark exactly opposite and behind you. Now in some nondestructive way, mark where you are with something that can be seen. From a distance – rocks, a scrap of toilet tissue perhaps. When you walk to the far landmark, sight back lining up the landmark that was behind you (originally) with the “temporary” marker you set. This line (bearing) will be your original course.

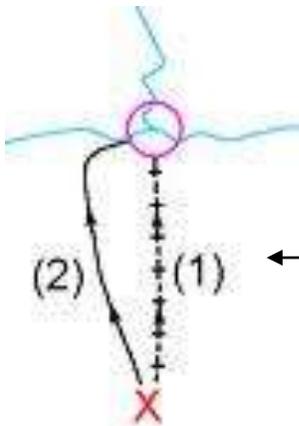
(Add picture of lake and back sighting)

9. I can find it on the map, but I can’t see it! Now what?

If your next course waypoint is obscured, or has a hostile area between you and it, you may have no choice but to pace it off, turning at right angles and recording your paces. Or the time elapsed. This picture describes this procedure.

((Insert illustration of p 65 for pacing around an obstacle.))

10. What is “aiming off”? It’s a ‘deliberate error’ that has a very useful purpose.



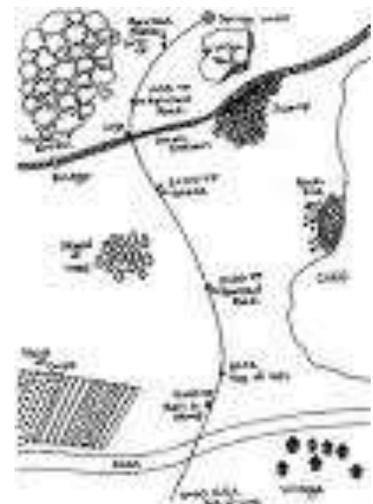
Aiming off is a deliberate error or an intentional offset. Instead of following your route to a baseline, then having to guess which direction is correct to reach your intended waypoint/control point, aiming off (deliberately going to one side of the control) will ensure that when you reach your baseline (such as a road, or stream, etc.) you will KNOW which way to turn.

← (Illustration of aiming off)

11. Draw your own map. How is that useful?

When you need to do a route finding procedure it’s a good idea to draw a map, noting bearing, landmarks, obstacles and your paces. Sometimes you will encounter unexpected obstacles and you will need your notes. This is especially useful if you have to return to a spot, or if you need to send someone else to a spot (For example, if you had an injured person who had to be rescued.)

(Sketch of a page with a personal hand drawn map) →



12. A few hints about accuracy in the real world.

Make careful, accurate sightings when selecting landmarks (both intermediate and destination landmarks).

Follow the direction-of-travel arrow when walking a bearing.

Recheck bearings carefully and often, so as to avoid the accumulation of small errors

Use bearings over short points when possible.

Aim for a line, rather than a point, whenever possible. For example, a road or a stream will be easier to hit than a specific feature on the road, or a waterfall on the stream.

When sighting a bearing, it is best to select points that will always be in sight, for example, a prominent tree and a rock crag. That way, if you have to detour off course, you can easily resume your course line once the detour is done.

Continually relate your progress to your map, and as needed, update your own drawn map.

3. TOPOGRAPHIC MAPS - THE BASICS OF MAP READING



3.1 TERRAIN FEATURES

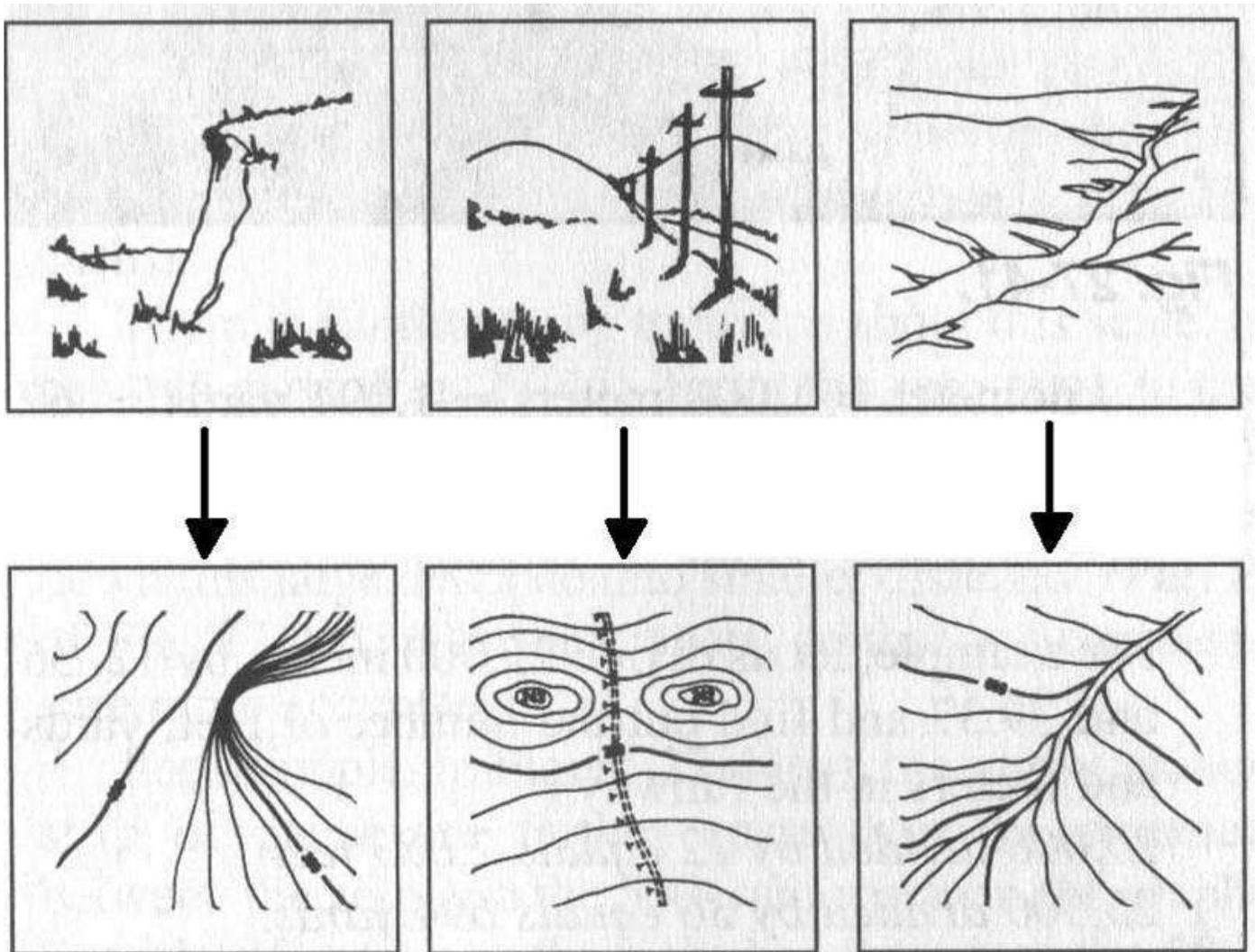
Highway maps view the ground as 'flat'. Topographic maps depict a detailed picture of the shape of the land, illustrating terrain and natural features using symbols, colors, and lines of elevation (contour lines). The most accurate maps come from the USGS -US Geological Survey, and the Forest Service and National Park Service print some. Whichever you use, be sure it is the most recent version.

The object of the topo map is to decipher the features of the land and "see" the land.

3.2 CONTOUR LINES

Contour lines show the shape and elevation of the land surface. A contour line is a line of parallel level surfaces which connect points of equal elevation with a different line for each elevation. The lines are drawn at specific intervals, with every fifth line drawn heavier so as to make it easier to read. The hiker is interested in the general appearance and shape of the land.

Here are some examples of land formations as they appear on a topo map.

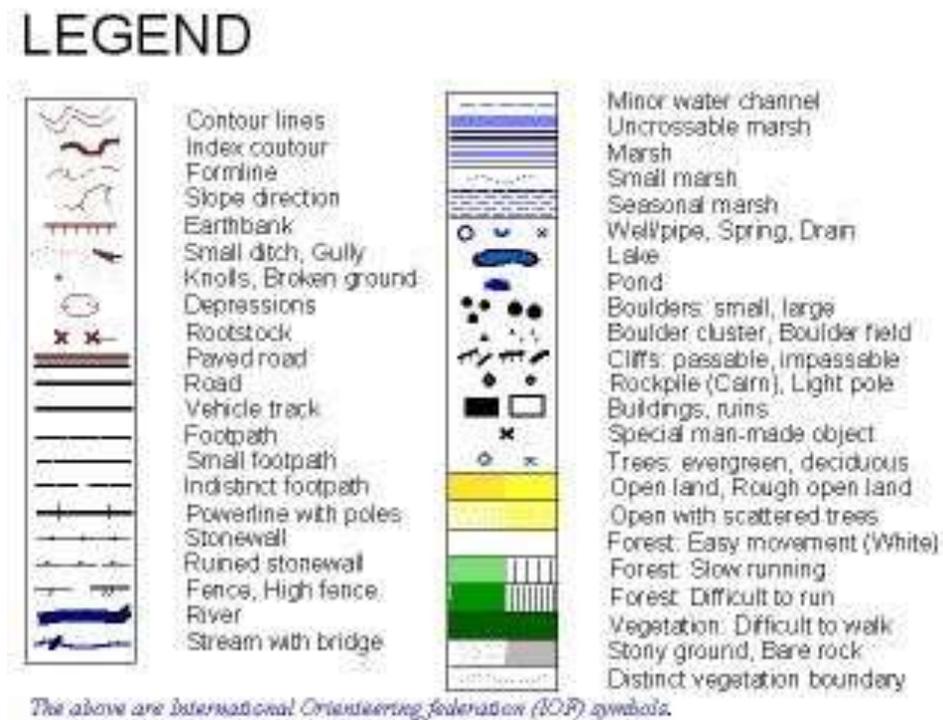


3.3 TOPO map SYMBOLS & COLORS

COLORS-

- Black: Used for man-made features and cultural areas such as buildings, roads, railways, pipelines, and property boundaries.
- Brown: Used for topographic and surface features such as contour lines.
- Green: Used to show vegetation features, such as woods.
- Blue: Used for water features, such as rivers, streams, lakes, and swamps.
- Red: Used for main roads, such as highways. It can also be used to show special features like a tunnel or survey lines.

SYMBOLS - Symbols on a Topographical Map



3.4 SCALE & DISTANCE MEASURING ON A MAP

SCALE - The scale of a map indicates the relationship of distance measured on the map to distance measured on the ground. Maps that are most useful to the foot traveler will be the 7.5 minute map, with a scale of 1: 24,000. ONE THE MAP, ONE INCH REPRESENTS 24,000 INCHES ON THE GROUND. One mile of ground is about 2-1.2 inches on the map. This map is very useful for detail. If the hiker uses the 1:24,000 map along with a "15 minute map" the hiker will be able to have both detail, and additionally information from the 1:62,500 scale where 1 inch on the map equals 1 mile on the ground. The scale is usually noted on the lower left of the map.

BAR SCALES - Printed with the map's legend the Bar Scale gives a way of measuring distance on the map in kilometers, meters, miles & feet. Generally, a map of 1:24,000 WILL BE IN MILES, A MAP OF 1:25,000 will be in kilometers.

(Illustration of scales and different levels of detail from 7.5, 15-minute map...)

3.5 HOW TO ORIENT A MAP – Which way do I turn this paper? And why?

ORIENTING VISUALLY - Orienting a map means matching map and landscape. If the visibility is good, you can usually do a “visual inspection” and line up the map without a compass. This is done by sighting across several significant landmarks and turning your map so that it corresponds. It is useful to keep the map “oriented” as you travel will help the hiker keep up with the “larger picture” and his position in it. Make this a habit and it will serve well. It is also a wise to have your map enclosed in plastic, a plastic bag, or laminated, so that water will not ruin it.

3.6 DECLINATION - ORIENTING THE MAP USING A COMPASS

BEFORE WE CAN ORIENT USING A COMPASS, WE MUST DISCUSS DECLINATION.

WHAT IS TRUE NORTH? WHAT IS MAGNETIC NORTH?

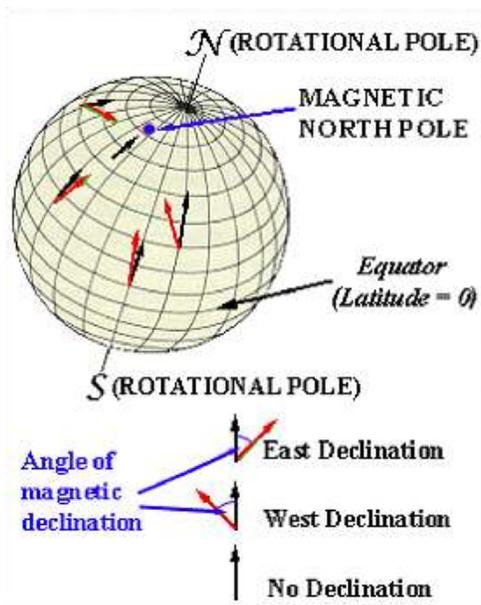


Most maps are oriented to TRUE NORTH. True north is the rotational axis of the earth in the northern hemisphere.

(Illustration of world with latitude and longitude lines). The lines of Longitude converge at the TRUE NORTH WITH TRUE SOUTH. LINES OF LATITUDE parallel the equator.

MAGNETIC NORTH is the direction your compass points. The physical location of Magnetic North (the Magnetic north pole) is an area in northern Canada where the earth’s magnetic field is strongest. This area drifts somewhat, so it is not a specific fixed spot. At this time it is in the Canadian Arctic, about 800 miles from the geographic (true) north,

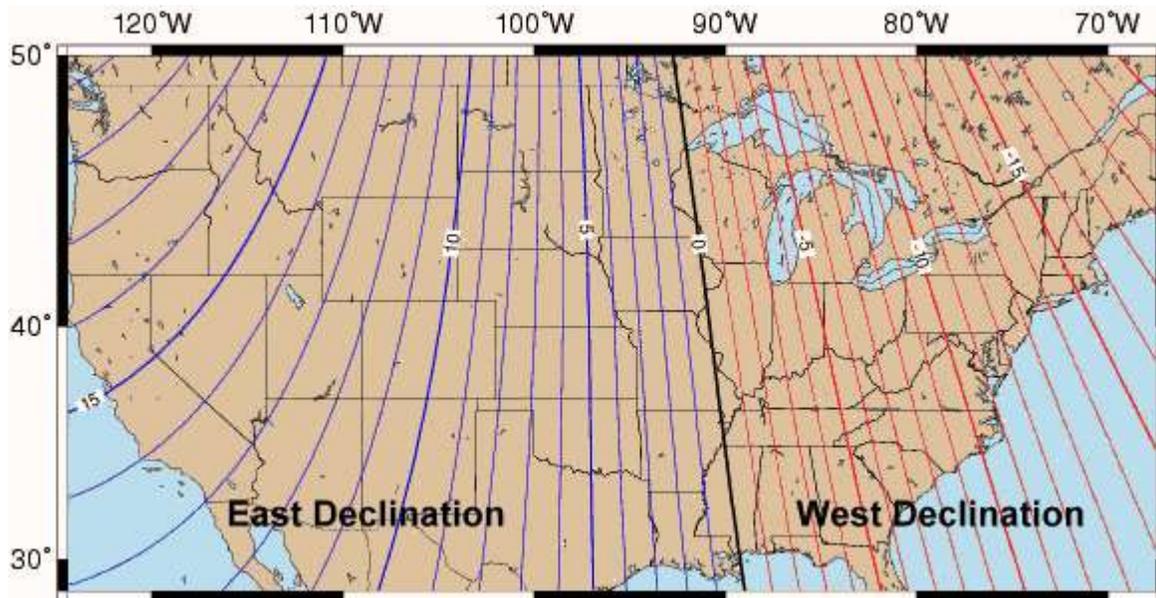
WHAT IS DECLINATION AND WHY DOES IT MATTER?



DECLINATION is the difference between TRUE NORTH & MAGNETIC NORTH.

You need to know the declination for the area where you are hiking, so that you can adjust your map and use your map and compass together.

In the continental United States, the declination can be anywhere from 0 degrees to 20 degrees west (in northern Maine), or 0 degrees to 21 degrees east, as in Washington state. These degrees are the differences from Magnetic north to True North. Around the center of the USA the declination is 0 degrees. This 0 degree line is called the Agonic Line. If you are on that line, in that area, the magnetic north and the true north are along the same line. Anywhere else, however, that is not the case, and adjustments must be made so that you can use your compass and map accurately.



The declination of the map you are using will generally be written with the legend or the scale of your map. You will need to make a calculation in order to use the map and compass for your hiking in your specific area.

ORIENT YOUR MAP AND APPLY DECLINATION TO USE YOUR MAP AND COMPASS TOGETHER –

- 1) DO NOT IGNORE DECLINATION. IT CAN BE THE DIFFERENCE BETWEEN BIG ERROR AND ACCURACY in your hiking. Most maps are aligned to TRUE NORTH, and the compass points to MAGNETIC north.
- 2) Your compass is your guide while traveling cross-country. From time to time you will want to consult your map to verify where you are and to learn what lies ahead of you beyond your immediate view. Before you can use your map to best advantage, you will want to **“orient” it with respect to your surroundings**. Your compass will immediately tell you which way is magnetic north. You must align your map so that it coincides with your surroundings AND the compass. HERE IS HOW TO DO THIS:

- 3) Spread your map on any flat, level place, lining the map up with the landmarks you can see. Also, be sure that you are away from any metal objects that could “confuse” the compass.

Turn the compass housing so that north is exactly at the index line. With north at the top of the map, place one side edge of the compass base plate along either side edge of the map, which are the only lines guaranteed by the mapmakers to run true north-south.

1. For an EASTERLY declination: the north-seeking end of the needle points to the number on the dial that is your declination.

2. For a WESTERLY declination: the needle points to 360 MINUS the declination.

The map is now **“oriented”**. Directions on the map match directions on the land around you. Anchor the edges of the map with rocks, sticks or any nonmetal gear. It's VERY IMPORTANT THAT THE MAP REMAINS ORIENTED DURING ALL MAP AND COMPASS PROCEDURES.

3.7 SUMMARY OF COMPASS USES

The compass can be used to perform many steps for you in path finding, including:

- 1) To establish and maintain a straight-line course of travel to a previously chosen landmark or destination, or even a random direction.
- 2) **To make accurate “dogleg” offsets when detouring an obstacle.**
- 3) To find your way back to camp, to your starting point, or to some other chosen location.
- 4) To determine azimuth of visible landmarks or other terrain features by sighting them.
- 5) To orient a map or route sketch.
- 6) To find your position on the map.
- 7) To measure on the map the azimuth to other points from where you are.
- 8) To plot your route of travel on a topographical or other map.
- 9) To assist you in making a sketch map or a route sketch.
- 10) To find true direction (when compass variation is known).



4. DIFFERENT TYPES OF MAPS

4.1 PLANIMETRIC – Highway maps, many state maps and local road maps generally cover a large area and treat the ground as flat. Roads and cities are accurately depicted, and major land formations such as mountains may be suggested, however, these types of maps do not provide the detail and information that a hiker needs to navigate trails.

4.2 PICTORIAL – Pictorial maps use shading and lines to suggest the texture and shape of the land. While the pictorial map can aid in planning, it does not have sufficient detail for navigation.

4.3 TOPOGRAPHICAL – This map is the friend of the hiker! Available in different scales, the topographical map shows the shape of the land, contour, natural land features and man-made features. Depicted features include cliffs, mountains, valleys, ridges, trails, ponds, as well as man-made features such as towers, shelters, bridges, highways, and power lines.

4.4 Topographical maps are developed by several agencies, but the one whose maps are most widely used are those from the USGS – UNITED STATES GEOLOGICAL SURVEY. National Parks and Forest Service will often provide recreational maps using the information from USGS maps, which are updated regularly. Most hikers will usually use a combination of maps depending on where they are hiking. Whichever map you decide to use, it is important to use the most recent version of the map.

4.5 ORIENTEERING map – Large-scale map made for a specific location. Usually these are 1:15,000 or even a 1:10,000 scale, with legends and colors related to orienteering. IOF is the International Orienteering Foundation. IOF maps will include IOF symbols, IOF terminology, vegetation colors and magnetic north lines.

Most orienteering maps use a computer program OCAD. This is the standard for orienteering maps.

4.6 WHERE TO GET MAPS ON THE INTERNET –

A demonstration version of OCAD can be downloaded.

USGS itself has maps online. Also USGS OFFERS FREE AERIAL PHOTOS AND SATELLITE PHOTOS.

4.7 HOW TO MAKE YOUR OWN ORIENTEERING MAP-

For an area without an orienteering map you can use a USGS topographic map and add detail, including symbols, and magnetic north lines. Use tracing paper.

Try www.purplepen.com for a free program to make orienteering maps.

To make an orienteering map from scratch, you will need to scout the area over several hours, noting potential control points, terrain, vegetation, hazards, man-made features. From these, you can develop a potential course. Your detail will highlight the areas applicable to your intended course. Your completed map will show features, course lines, and scale it can be a **“stick figure map”** or a **map with more illustration of vegetation, features and terrain sketches.**

(Allow room for stick map, and another of sketch) poss. Shepherds or Stumpy Creek.)

5. LAND NAVIGATION & ORIENTEERING -

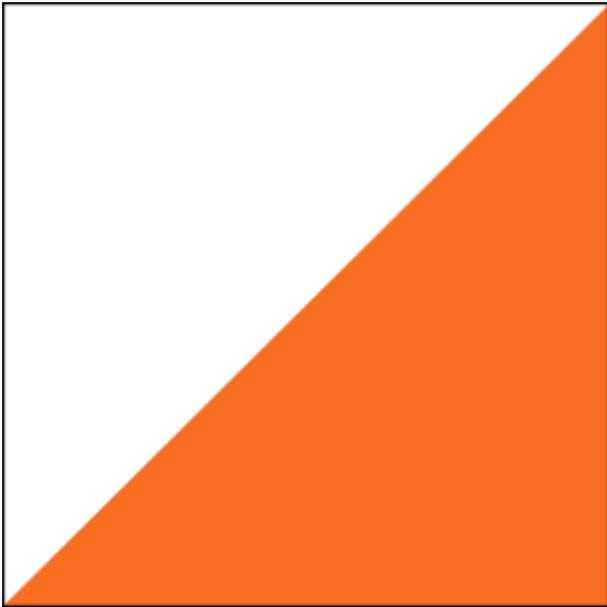


5.1 What is Orienteering

Land navigation is making your way across the land, using various tools (map, compass, sun). **Land navigation could be considered 'path finding'**.

Orienteering is a cross-country race in which participants navigate between checkpoints along a specified course (unfamiliar course, generally) using map and compass.

INTERNATIONAL ORIENTEERING SYMBOL



What is Orienteering?

Orienteering is a sport in which orienteers use an accurate, detailed map and a compass to find points in the landscape. It can be enjoyed as a walk in the woods or as a competitive sport.

A standard orienteering course consists of a start, a series of control sites that are marked by circles, connected by lines and numbered in the order they are to be visited, and a finish. The control site circles are centered around the feature that is to be found; this feature is also defined by control descriptions (sometimes called clues). On the ground, a control flag marks the location that the orienteer must visit.

To verify a visit, the orienteer uses a punch hanging next to the flag to mark his or her control card. Different punches make different patterns of holes in the paper.

The route between "controls" (refers to the flag or the site) is not specified, and is entirely up to the orienteer; this element of route choice and the ability to navigate through the forest are the essence of orienteering.

Most orienteering events use staggered starts to ensure that each orienteer has a chance to do his or her own navigating, but there are several other popular formats, including relays and events in which the orienteer must find as many controls as possible within a specified time.

5.2 ORIENTEERING AS A SPORT-

There are two major forms of orienteering competition: score orienteering and cross-country orienteering, sometimes known as fee or point-to-point orienteering.

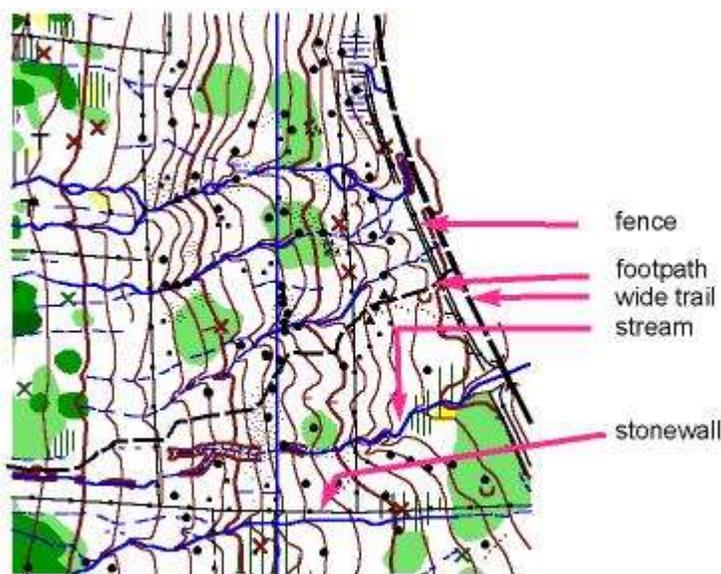
5.3 ORIENTEERING SYMBOLS – Orienteering competitors are provided with a control description, which is rather like a clue sheet. For beginners, the symbols are provided and also written out. For the more intermediate and advanced orienteering courses, the control sheets are in a table format with symbols.

Below is a list of INTERNATIONAL CONTROL DESCRIPTION SYMBOLS

(FROM BSA AMERIT BADGE BOOK, OR RAGAINE WEBSITE – SYMBOLS FROM COLUMNS C-H – USE A COPY OF CONTROL SHEET SAMPLE.

5.4 ORIENTEERING VOCABLULARY-

As with many sports, orienteering has its own vocabulary.



Basic handrails

ORIENTING THE MAP – matching the orientation of the map to the features on the ground. This is one of the fundamental skills in orienteering, and leads to successful navigation. The map can be oriented either by comparing the map directly with the terrain or by using a compass to orient to north.

HANDRAILS – These are linear features that provide easy travel, continuous direction and accurate position. Either artificial or **natural, these “handrails” might be streams, trails, fences, roads or even power lines.** The more subtle handrails might be ridgelines, valleys or tree lines. You will find that the **beginner course has many “handrails”** to aid the novice.

Handrail – A linear feature which closely parallels your route and acts as a handrail to the next control.

CONTROLS – Checkpoints. These can be temporary or permanent. Permanent markers are usually posts 2 feet above the ground with an identifying marker of the orienteering symbol. Sometimes there is a punch or other recording device attached. A training or recreational course may not have this.

(Temporary) CONTROL/CONTROL MARKER – a trapezoid-shaped marker (usually orange or red and white) used to mark features on an orienteering course, usually with clipper or control-punch attached to mark a control card as proof of arrival.



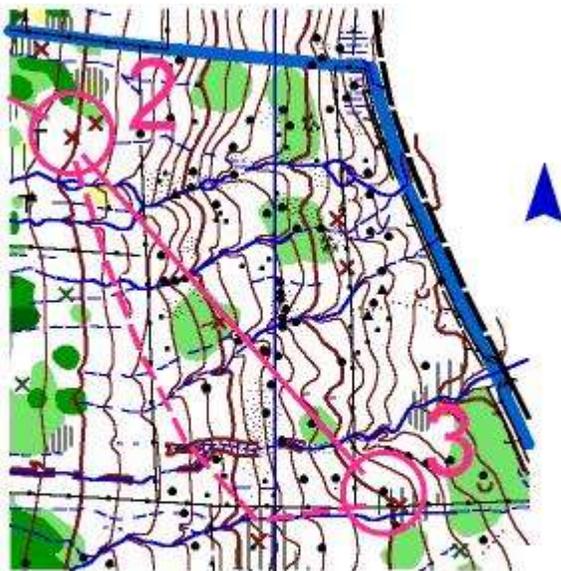
COLLECTING FEATURES – Features between you and the control. Features along your route. For example, a pond, or a large boulder, or a building might be a collecting feature. You will use these features to confirm your correct direction.

CHECK OFF FEATURES – Although less obvious, the check off feature is also very important. **As you pass features on your map and on your course, you can “check them off”, verifying that you are on the intended route.**

CATCHING FEATURES – A “catching feature” will catch when you have gone too far. This “catching feature” would be a landmark that, you will reach when you have passed the control, or strayed from your route.

ATTACK POINT - This is an obvious point that is close to your control. From the attack point you can apply precise navigation to reach the control.

AIMING OFF or OFFSET TECHNIQUE – This is an intentional offset to your control. Using this technique will ensure that you know which way to turn to go towards your control.

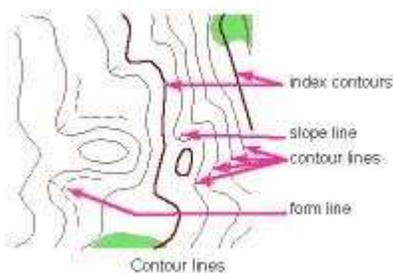


aiming off - participant aims to the right of the control to the stream and then heads left to following the stream to the control.

PACE COUNTING/PACING OFF - a system of counting double-paces (every time the left or right foot hits the ground) to measure distance covered. An orienteer would measure the distance between two points using the scale on the compass and then count his/her paces until the distance was covered. Pacing allows an orienteer to know when he or she has perhaps gone too far and missed the feature they were looking for.

Aiming Off - to deliberately aim to one side of a control or feature so that you know which way to turn upon hitting the feature before seeing the control.

READING AHEAD – Looking ahead in your instructions or control sheet so that you have an idea of what is next.



CONTOURING – Following the land such that you stay at the same elevation. While doing this may not be a direct route to your control, it often makes more sense to follow a curved level route instead of a downhill/uphill with more challenging terrain or risks.

Contour - a line on a topographic map that connects points of equal elevation.

ROUGH ORIENTEERING vs. FINE ORIENTEERING - **ROUGH ORIENTEERING** means moving in broadly defined directions towards a major feature (collecting feature). Reaching the desired collection feature, switch to **FINE ORIENTEERING** means locating yourself precisely and forming a precise plan to navigate to the control, with accuracy as the primary goal.

6. Orienteering



Orienteering is great outdoor sport for individuals, families or groups. Competitions cater to all three.

Orienteering is an outdoor sport enjoyed by people of all ages and abilities. The usual type of event is to navigate on foot around a forest or fell using a specially drawn orienteering map to visit a series of controls that have been placed on a course. The time taken to complete the course is recorded, and the quickest time wins. However, not everyone regards it as a race, and you are advised to go at your own pace. Finding the controls in the correct order is much more important than the time taken. At each event, there are usually several courses of varying length and difficulty. The courses are normally distinguished by color codes. Start times are usually staggered over a two-hour

period, so you won't start at the same time as another competitor on the same course. This means that when you are out in the forest, parkland, or wherever, no-one knows how well, or badly, you are doing. At most events you can, if you want, compete in pairs, small groups, or families.

6.1 CHOOSING YOUR COURSE

At most local events there will be a number of courses, each identified by a color-code, suitable for all ages and abilities, from the very young, through fit young (and not so young, or not so fit!) adults to the active retired, and from complete novice to experienced orienteer. In general, the courses can be categorized as follows:

ORIENTEERING COURSE LEVELS (US SYSTEM)

White (Beginner or map hiker):

- Average length of course: up to 3 km
- Average number of controls: up to 8
- Difficulty of control placement: easy, obvious locations along roads, paths and other major linear features
- Orienteering skills necessary to complete course: basic map reading, ability to take a safety bearing with a compass
- Approximate winning time: 30 minutes

Yellow (Advanced Beginner):

- Average length of course: 2.5 to 3.5 km
- Average number of controls: up to 10
- Difficulty of control placement: near large map features, less obvious than white course features
- Orienteering skills necessary to complete course: more precise map reading and simple compass use
- Approximate winning time: 40 minutes

Orange (Intermediate level):

- Average length of course: 4 to 5 km
- Average number of controls: up to 10
- Difficulty of control placement: varied difficulty, difficult controls are introduced with large collecting features
- Orienteering skills necessary to complete course: good map reading, basic pace counting, beginning rough and precision compass skills
- Approximate winning time: 50 minutes

Advanced level courses (Brown, Green, Red and Blue) These are all elite- or expert-level courses. Controls are placed in difficult locations on small features. There are often several route choices to a control. Courses combine all orienteering skills.

Brown: 3.5 to 4.5 km; up to 10 controls; winning time 50 minutes

Green: 4 to 5 km; up to 12 controls; winning time 50 minutes

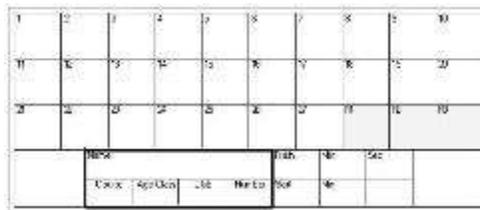
Red: 5 to 7 km; up to 15 controls; winning time 60 minutes

Blue: 3.5 to 4.5 km; up to 20 controls; winning time 60 to 80 minutes

(The *string course* is literally a 500m - 1 km piece of string, laid out on the ground, which competitors as young as two or three can follow to the control kites. The string course is usually free and doesn't require registration, just go to the string course start (which will be separate from the main start).)

At registration, you may receive a control description list on a slip of paper for your course (sometimes these are picked up at the start). The same details are often, but not always, printed on the map. Anyone entering White or Yellow courses, usually run by juniors, is given their map at registration, so that the course can be discussed with parents before starting. Everyone else gets their maps at the start. If electronic punching is *not* being used you will also be given a control card with numbered boxes which you "punch" at each control as you complete your course. If the registration marshal hasn't filled in the details such as your name, age class, etc. in all the relevant areas on the card, do this now.

Each competitor is required to carry a control/punch card. The card has to be presented at the Start line and handed in at the Finish line, whether or not the competitor decides to complete the course. The control card is marked by needles or electronically at each control point to show that the competitor has completed the course correctly. All controls need to be punched in the order they are shown on the map. Most events now use electronic punching, although cards and needle punches are still widely used.



6.2 DOING YOUR COURSE

You must visit the controls in the correct order, as listed in the descriptions. Each control will consist of a red and white marker kite with a label carrying the appropriate control code and either a pin clipper if traditional punching is being used, or an electronic "punch box" if electronic punching is being used. If traditional punching is being used, clip the correct box on your control card after checking the code. If electronic punching is being used, insert your dibber into the hole in the electronic punch box and wait for a beep and the LED to flash (it'll take less than a second). Continue round the course, choosing your own route, but visiting the controls in the correct sequence for your course. Keep out of any areas marked out of bounds.

6.3 CONTROL DESCRIPTION CARDS

Control description cards provide information about the control site and control marker (flag). For beginners, this is done in plain English (or whatever prevailing language). For more experienced orienteers, a set of internationally-recognized symbols are used so that a common language is not required in order to compete fairly against each other.

A beginner's control description card will have three columns. Column 1 contains the Control Number, column 2 the Control Code, and column 3 the description of the associated control feature (and details about the placement of the control flag in relationship to the feature if required).

* M = meter. The standard in Orienteering is to use metric units.

Sample control descriptions:

Start: Trail junction		
1	345	NW CORNER OF BUILDING
2	541	JUNCTION OF STREAM AND TRAIL
3	246	EVERGREEN TREE - NORTH SIDE
4	675	SOUTHEAST CORNER OF FIELD
5	888	NORTHEAST FOOT OF 5 M CLIFF
6	443	N. SIDE OF 2.5 M BOULDER
7	431	TOP OF KNOLL
8	234	BEND IN DITCH
9	212	SW TIP OF MARSH
Follow streamers 100 meters to finish		

6.4 CONTROL DESCRIPTIONS: Control descriptions show the control in relationship to close surroundings, known as features. Such surroundings could be a trail, group of trees, bridge, road, crag, ditch, or manmade feature, to name a few. The complete reference guide to International Specifications for Control Descriptions can be found at www.orienteering.org.

Control sites must be precise locations that are found on the ground and clearly indicated on the map. Generally, if controls are within 50 meters of each other, they must be on different types of features to avoid confusion of the participants. Starting points must be at precise locations just like controls. It is common to use streamers to guide participants from the last control to the actual finish line.

Places where control sites are commonly located:

- Point features (small, distinct objects) such as boulders, knolls, pits, depressions, rootstocks (root systems of uprooted trees), wells, cairns (rock piles), individual trees.
- Corners of larger features: buildings, lakes, fields, swamps, paved areas, building ruins.
- Junctions of 2 or more similar or dissimilar features such as trails, streams, fences, roads, stonewalls, and power lines.
- Bends in a feature such as trails, streams, fences, roads, stonewalls, and power lines.
- Top or bottom ("foot") of features such as cliffs, earth banks, and small knolls.

- Distinct land forms such as reentrants, ditches, and spurs.

6.5 GPS – TOOL OR CRUTCH?

The GPS – Global Positioning System – is a remarkable tool that will search satellites and fix your position relative to latitude and longitude. GPS devices are designed for car travel, or for trail travel.

The geographic positioning system (GPS) links to a system of satellites orbiting at fixed locations around Earth. The satellites send signals down to the surface. The unit in your hand picks up and triangulates the signals from several of the satellites to compute your location. Some units are capable of measuring altitude as well.

Some GPS units can be programmed to read lake maps, including depth contours, stored in the unit's memory. These are popular with anglers. Other units can carry detailed topographic maps, sun and moon cycles, and a built-in barometer, which are popular features with both hunters and anglers."

Because they are used outdoors, most GPS units have some degree of weatherproofing. Some models float, a desirable feature if you are fishing, paddling, boating or sailing. The most popular units sold at REI run about \$200 and are packaged with map software.

With the expanded memory capacity, units can hold a large number of highly detailed maps. Most places selling GPS units also carry map databases on compact discs with the quality and detail of the 7.5 minute, 1:24,000 topographical maps published by the U.S. Geological Survey. Users can download data to a CD using a home computer and then load the desired maps onto the GPS unit's removable memory.

Mapping software allows detailed route planning that displays elevation gains and losses, distances and waypoints. Waypoints, which are essentially dots on a map, can be recorded in the field; these points of interest can be transferred to a map when the user returns home. There are a number of software brands and features for GPS units with prices starting at around \$100.

Units sold these days are capable of displaying your position and your destination in several ways. In addition to maps, numerical latitude and longitude readings are also displayed. Positions are pinpointed electronically using other numerical systems. Many users choose the UTM or Universal Transverse Mercator system that shows 1,000-meter-square grids, making it relatively easy to calculate distance from one waypoint to another, or to plot your position onto a paper map in the field using the information displayed on the unit.

Direction-of-travel may be shown graphically as in an electronic "road" on the screen, which the user follows. Or, users can choose a more traditional compass bearing. Backcountry users still need to interpret a map because the direction between two points is shown as the shortest possible distance – in other words, a straight line. Straight-line travel often is not possible due to rivers, lakes, canyons or steep terrain that requires the hiker to assess the topography and plan a route.

GPS is a great tool – but like any technology, it may not operate properly due to environmental conditions and shouldn't be used exclusively, say experts.

GPS doesn't replace traditional map and compass skills. It's a great addition to backcountry navigation but it can fail or get dropped and broken, and if you can't find your way with a map and compass, your trip will be spoiled at the least or you may end up in a serious situation.

REI offers classes on how to use GPS. The course is called, appropriately, GPS 101, and is offered periodically based on demand; advance registration is required. Students have a classroom session then get some hands-on experience in the store's parking lot.

. As with any electronic item, battery power is required. Without proper battery power, the device is useless. Additionally, good satellite reception is also required. On a cloudy, rainy or snowy day or night, or in deeper valleys, satellite reception might be questionable and the GPS less than reliable.

Can the GPS help? Yes indeed. Is the GPS a substitute for compass and map skills? Absolutely not. While it is extremely useful to have a GPS and know how to use it, it is unwise to rely on it without knowing other compass, map and land navigation skills.

7. Things to Remember



7.1 WHAT TO DO IF YOU DON'T KNOW WHERE YOU ARE

Next to carrying a cell phone, of all the strategies lost people use to get "unlost," the best one is to stay put and wait to be found. Unfortunately, it's also the one hunters and hikers – the subjects of most search and rescue (SAR) missions – use the least. Even so, statistics show that more than 95 percent of all searches end successfully within the first two days.

"Hunters and hikers are the subject of almost 40 percent of all searches," says Robert Koester, a national SAR expert and author of *Lost Person Behavior*. "Hunters tend to focus on pursuit of their game and follow it into unfamiliar territory. They are also more likely to 'self-rescue,' perhaps to avoid embarrassment or the fear of paying rescue fees. A third of them find their way out on their own. Because they rely on GPS, radios and cell phones, many lack outdoor skills. And unlike hikers, they're more apt to abandon a trail and strike out cross-country if they think they're headed in the right direction.

"Hikers, on the other hand, are trail oriented and tend to get lost as the result of a navigational error, such as taking the wrong trail, reading a map upside down, or not even noticing that they've left the trail." So don't get lulled into thinking that it can't happen to you – even the most veteran outdoor enthusiast can get lost. Your comfort – even survival – can depend on how well you are prepared.

7.2 PREVENTION AND PREPARATION

It won't prevent you from getting lost, but the most important thing to assure you will be found quickly should be done before you even leave home for a hunt, hike, pedal or paddle. Tell someone *exactly* when you are leaving, precisely where you are going and when you expect to be home. Then, *stick to your plan*. Be specific so that if you are reported lost, the SAR (Search & Rescue) folks can narrow their search and quicken your rescue. Tell family members or friends to contact the local sheriff's office who will mobilize other official and volunteer searchers.

"If you haven't planned ahead, it's a good idea to leave a note in your vehicle saying 'Gone for a two-hour hike to the west at 2 p.m. on June 1,'" Here are some further steps you can take to prepare yourself:

- Travel with at least one other companion so you can help each other.
- Get a GPS unit and learn to use it before going into the woods.
- Before setting off, set a waypoint for your vehicle.
- Learn to use a compass. GPS units and cell phones don't always work.
- Take an orienteering class.
- Pack a reliable map of the area, preferably on durable, waterproof paper. Learn to interpret topographic contours and symbols and know what landmarks to look for.
- Check weather forecasts and wear appropriate clothing for season and conditions. Be prepared for changing conditions.
- Learn basic first aid. Know how to tell the signs of heat exhaustion, heat stroke, hypothermia and dehydration, and how to treat them.
- Practice starting a fire with something other than matches or a lighter, like magnesium and steel.
- Ask a search and rescue group to give a presentation to your sporting club, school or civic group.
- Visit a sporting goods store or go online to get ideas for the best survival kit to suit your needs. Pack your kit and keep it replenished and up-to-date on an annual basis. Keep it in

your vehicle's glove box so you don't forget to take it. (See sidebar below for suggested items.)

- When hiking, biking, skiing or snowmobiling, stay on marked trails. Look around for features and landmarks along the trail that will remind you of where you have been; stop often and look back to see what the trail looks like from the opposite direction.

7.3 LOST!

It's happened: despite your best efforts and intentions, you're lost. What to do now? It might help to remember a common tip – the STOP method:

- **STAY PUT!** Moving around wastes precious time and energy, increases your anxiety and makes you even harder to find. Sit down and stay calm.
- **THINK!** Take inventory of what you have with you, what you can find and use around you, and what you need to do to make yourself safe and comfortable. Remember the rule of three: you can live three minutes without air, three hours without warmth, three days without water and three weeks without food.
- **OBSERVE!** Use your compass and map and try to determine your location and heading. Look for landmarks that you can identify on the map. This may help you re-orient and get headed in the right direction. If not, check how much daylight is left and what the weather is doing.
- **PREPARE!** Plan what you need for an overnight stay to keep warm and dry. Based on the rule of three, decide whether you need to build a fire or shelter. Gather tinder, kindling and fuel. If you followed the basic rule of the outdoors and told someone your plans before leaving, you can plan to be found within a day or two and food may not be your top priority.

Stop, catch your breath and determine if you are probably going to have to spend the night in the woods. If so, find a sheltered spot out of the wind and give yourself enough daylight hours to gather enough wood to start a fire, keep it burning all night, and build a shelter.

The next step depends on whether or not you told someone when and where you were going. If you did, you should settle down, sleep, stay put the next day and wait to be found.

If nobody knows where you are and when you left, you're probably better off making plans to walk out in the morning. You'll need to know what direction to walk and make sure you walk a straight line. Here's one way of figuring that out, and the next step you should take in your plan."

First, place a stake in the ground near enough to your fire that you can see it, but can also locate stars. Have another stake handy. Under darkness and provided it's a clear night, says Thiel, locate the pointer stars of the Big Dipper. Hold your hand in the sky, place your index finger and thumb over them and "walk" your hand in the air in the direction they point to; walk seven "finger-thumb" distances away and you'll arrive at the North Star. Align yourself so that the stake you put in the ground is between you and the North Star; drive the other stake in the ground so the North Star, stake #1, you and stake #2 are aligned in a straight line pointing north and south.

7.4 BUILDING SHELTER

This simple survival shelter was built against a fallen tree stump.

In most states, roads surround all wooded terrain no matter how large the forested expanse. So,



in the morning, you should walk out in one of four cardinal directions by aligning yourself to the two stakes you put in the ground. Decide which direction you will take, face that direction and look for something unique like a stump in direct alignment with them. Walk to it and look back to make sure you are still in alignment with the stakes. Then look ahead to another unique object and walk to it. Look back to the first object and repeat this process until you literally walk out onto a road.

If it's already dark and building a shelter isn't an option, try to find a large spruce or fir tree with branches to the ground and huddle at its base. Gather or cut green boughs and whatever soft dry material you can find as insulation to sit or lie on.

One of the easiest shelters you can build is a debris hut. Look around for a natural structure to use as a base, like a fallen or uprooted tree. Make sure the tree is sturdy and won't shift and fall on you once your shelter is built. If you have to, make your own base by propping a long sturdy branch on a stump or in the crotch of a tree about waist-high.

Here's where a tarp, space blanket or poncho comes in handy. Drape it tent-like across the base and use rocks to hold it secure to the ground. If you don't have a tarp, lay sturdy branches along the base as close together as possible.

Then search the woods for whatever kind of insulating material you can find to add to the roof – green spruce or pine branches, sticks of varying sizes, and any other kind of debris you can find. The thicker the insulation, the warmer your shelter will be. You can also use large chunks of decayed leaf litter from the forest floor placed like shingles across your roof. Start at the bottom and work your way up so water will run off and not leak through your structure. If there's snow on the ground, use it to pack on top of your roof. Line the floor of your shelter with a thick pile of pine boughs to insulate you from the ground.

Don't build your shelter any larger than your body. If there is a lot of air space around you, it won't be as effective in keeping you warm.

7.5 EQUIP YOUR CHILD TO SURVIVE IN THE WOODS

Chuck Keuhn of the Headwaters Search and Rescue Team, recommends that all children who spend time in the out-of-doors – whether it's camping, hiking or picnicking with their family – learn the basics of survival. One program that does just that was developed specifically for kids age 7-12. It's called the Hug-A-Tree and Survive Program and here's how it works.

- Always carry a folded large orange trash bag and whistle with you when you are hiking or camping. Have your parents make a hole in the sealed end just big enough for your head.
- Once you think you are lost, hug a tree! Make the tree your friend, talk to it. This will calm you down and keep you in one place so you won't be injured. It will also make it easier for people to find you.
- If you need to keep warm or dry, sit down and pull the bag over your entire body, with your head sticking out the hole.

- Blow the whistle three times every 5-10 minutes. The whistle can be heard from farther away than your voice and doesn't take much of your energy.
- Don't be afraid that your parents will be angry with you. Anyone can get lost so don't be ashamed or try to avoid people who are searching for you. They will be proud of you for using your head.
- Make yourself big if you hear an airplane or helicopter. Go to a clearing near your tree and wave your arms or lie flat with your arms and legs out, like you do when making a snow angel. If you can, make a big SOS with sticks, branches or rocks.
- Don't be afraid of noises at night. If you hear a noise, yell at it! If it's an animal, it will run away. If it's a searcher, you'll be found!
- There are hundreds of friends searching for you, so if you stay in one place it will be much easier to find you.

7.6 A GOOD SURVIVAL KIT

A good survival kit should be compact, lightweight and contain the bare necessities. Ideally, much of what you pack should serve more than one purpose. Look around your home and use your imagination. Prescription medication bottles make nifty waterproof containers, and mint tins hold an amazing array of small items. Here are some things to consider:

- Charged cell phone. Whether you keep it in your pocket or backpack, enclose it in a waterproof plastic bag.
- Compass
- Whistle
- Fire starting materials – disposable lighter, waterproof matches, magnesium and steel, candle, fire starter cubes, cotton balls soaked in petroleum jelly (all packed in a waterproof container). Bring three different kinds of fire starters in case a method fails to work.
- Orange plastic trash bag – can be used as poncho, ground cloth, shelter or to signal your location.
- Mini-flashlight
- Signaling device – mirror, foil, glow stick, plastic neon-colored tape
- Knife or multi-tool
- Poncho, space blanket or tarp
- Parachute cord or rope (about 25 ft.)
- Water purification tablets
- Several waterproof bags in varying sizes – to keep things dry and segregate items that get wet
- Prescription medication
- First-aid kit: antiseptic wipes, assorted bandages, tweezers, pain reliever, insect repellent, sunscreen, lip balm, tablets for diarrhea/upset stomach, safety pins

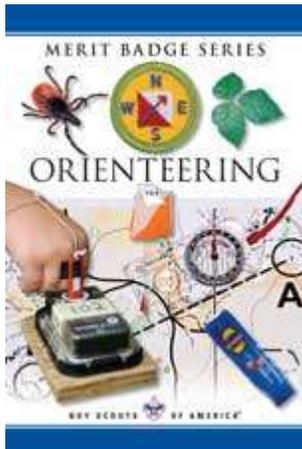
Other personal items to consider if you have room in your backpack are high energy foods like granola bars, candy and fruit; sunglasses; extra socks; rain gear; hat; and gloves.

7.7 STARTING A FIRE – If you have to be in the wilderness overnight

8. IN CONCLUSION:



Map reading and compass skills give people a fundamental understanding of topography and geography. They are fundamental skills of life. These skills are perishable. You must exercise these skills or they will fade. Learn to love the map and the compass. They are your friends.



Orienteering

Requirements were REVISED effective January 1, 2004.

1. Show that you know first aid for the types of injuries that could occur while orienteering, including cuts, scratches, blisters, snakebite, insect stings, tick bites, heat and cold reactions (sunburn, heatstroke, heat exhaustion, hypothermia), and dehydration. Explain to your counselor why you should be able to identify poisonous plants and poisonous animals that are found in your area.
2. Explain what orienteering is.
3. Do the following:
 - a. Explain how a compass works. Describe the features of an orienteering compass.
 - b. In the field, show how to take a compass bearing and follow it.
4. Do the following:
 - a. Explain how a topographic map shows terrain features. Point out and name five terrain features on a map and in the field.
 - b. Point out and name 10 symbols on a topographic map.
 - c. Explain the meaning of *declination*. Tell why you must consider declination when using map and compass together.
 - d. Show a topographic map with magnetic north-south lines.
 - e. Show how to measure distances using an orienteering compass.
 - f. Show how to orient a map using a compass.
5. Set up a 100-meter pace course. Determine your walking and running pace for 100 meters. Tell why it is important to pace-count.
6. Do the following:
 - a. Identify 20 international control description symbols. Tell the meaning of each symbol.
 - b. Show a control description sheet and explain the information provided.
 - c. Explain the following terms and tell when you would use them: attack point, collecting feature, aiming off, contouring, reading ahead, handrail, and relocation, rough versus fine orienteering.
7. Do the following:

- a. Take part in three orienteering events. One of these must be a cross-country course.
 - b. After each event, write a report with
 1. a copy of the master map and control description sheet ,
 2. a copy of the route you took on the course,
 3. a discussion of how you could improve your time between control points, and
 4. A list of your major weaknesses on this course. Describe what you could do to improve.
8. Do ONE of the following:
- a. Set up a cross-country course of at least 2,000 meters long with at least five control markers. Prepare the master map and control description sheet.
 - b. Set up a score-orienteering course with 12 control points and a time limit of at least 60 minutes. Prepare the master map and control description sheet.
9. Act as an official during an orienteering even. This may be during the running of the course you set up for requirement 8.
10. Teach orienteering techniques to your patrol, troop or crew.

Note to the Counselor:

While orienteering is primarily an individual sport, BSA Youth Protection procedures call for using the buddy system. Requirement 7a can be completed by pairs or groups of Scouts.