



Interviewing and Investigation

When a person is believed to be missing, it is considered an emergency, and someone must report it to the proper authorities. That person is called the *reporting party* and the lost person is called the *subject* of the search. Gathering as much information as possible, as soon as possible, about the subject is important for a successful search.



To fulfill requirement 4 for the Search and Rescue merit badge, you need to find out which agency in your area has the jurisdiction and responsibility for search and rescue. This varies from state to state and community to community, so you will need to do a little investigating on the Internet, but that is also a skill a good searcher must have. Also, make sure you know the reporting process in your town and in the area where you will be hiking or camping.



Interviewing

After a person is reported missing, a police officer or other trained investigator interviews the reporting party and any other witnesses who may have some knowledge about the subject. The interviewer is trying to get an accurate physical description, including type of clothing the subject was wearing, the equipment he or she may have had, and the subject's level of outdoor training and skill. It is also important to have an idea of the subject's mental state at the time he or she went missing.

It is important that the interview be done as carefully as possible. Remember that it is an interview, not an interrogation. The subject's friends or fellow Scouts may harbor feelings of guilt because their friend is lost. Most often the interviewer will ask questions of individuals rather than a group because there may be a strong personality in the group who offers the most—but not always the correct—information. By interviewing several people, the interviewer can get a much clearer idea of the circumstances that caused the subject to go missing. The interviewer will ask questions calmly so that the information gained can be as accurate as possible. This helps the incident commander begin to formulate a search plan or Incident Action Plan (IAP).

If it is determined that a search is necessary, a series of events unfolds in rapid succession.

A number of forms can be used during the interview to help the IC and command staff plan the search. These forms typically ask for the source of information, the reporting party, the reporting party's relationship to the subject, how to contact the reporting party later if he or she leaves the search scene, and what the reporting party believes happened to the subject.

The interviewer next seeks out basic information about the subject, including the following:

- The name of the subject
- Address and phone number
- Age and date of birth
- Height and weight
- Physical description including distinguishing marks
- Whether the subject wears glasses or contacts and whether these have been left behind or lost
- Type, style, and color of all clothing the subject was wearing when last seen

Having a photograph of the subject can really help the search.

If the subject left his or her pack or an article of clothing behind, it might be used as a scent item for a canine search. This is discussed later in the "Specialized SAR Teams" section.

Finally, the interviewer will ask what the subject's plans were. This basic knowledge helps determine the degree of urgency that the search must take.

A search manager (the IC) is then appointed and teams are activated.





Evaluating Search Urgency

Occasionally during a high-adventure backcountry experience an entire group can go missing. Hikers may have made a wrong turn at a trail intersection or failed to consult their map. If they have their gear, food, and water with them, and if weather conditions are favorable, the group may be considered overdue rather than missing. They very well may self-evacuate and get back on their planned itinerary. Searching for such a group would not hold very high urgency.

On the other hand, a missing young child or elderly person is an urgent situation.

Factors to be considered in determining search urgency include the subject's medical condition, his or her outdoor experience, the equipment he or she may be carrying, current weather conditions and the eight-hour forecast, and the terrain or hazards in the area. Each of these factors is assigned a number value. The lower the number, the greater the urgency.

See the resources section for links to examples of search urgency worksheets.

Lost Person Profiles

By analyzing the behavior of previous lost people, it may be possible to "predict" what subjects in similar situations might do, where they might go, or where they might be. This will be helpful as you complete your IAP (Incident Action Plan) and work on your clue awareness and tracking.

The analysis of thousands of search and rescue reports has found that people of certain ages and with certain interests have some of the same reactions to being lost. This section lists some examples.

Children Ages 1 to 3 Years

Children this young are unaware of the concept of being lost. Their navigation skills and sense of direction are almost nonexistent, and they tend to wander aimlessly. They tend not to respond to whistles or calls.

These children often seek out a place to lie down and go to sleep. This could be under thick brush, an overhanging rock, or a picnic table; inside a car trunk, camper, or building; or curled up with a pet. Other places to look are nearby bodies of water. Young children are difficult to detect and rarely walk out by themselves.

Children Ages 4 to 6 Years

Children this age have a developing concept of being lost and will attempt to return home or go to a familiar place. They may panic and become further lost as they attempt to "find" themselves. They are more mobile than 1- to 3-year-olds and may also use tracks, trails, or shortcuts that do not readily appear well-defined to an adult. These children sometimes become lost when they follow an animal or a group of older children. Children this age are often found in the same places as children ages 1 to 3.



Children Ages 7 to 12 Years

While children in this age group have more developed navigation and directional skills than 1- to 6-year-olds, the “mental maps” they have constructed of their environments may be highly inaccurate, and they frequently become lost while attempting a shortcut to a familiar location. They may also become lost during fantasy play or adventuring, and may become upset or confused and react irrationally, which can include trail running, putting them some distance from the PLS/LKP (place last seen/last known point). They may respond more maturely if they are with a friend or sibling. While they will attempt to find themselves, they often lack adult tactics.

To find children this age, check with friends about tracks, trails, shortcuts, and any “secret” or favorite places, hideouts, or routes. These children may have followed wildlife into wooded areas. Other places to search are buildings, parked vehicles, bodies of water and watercraft, and children’s attractions such as playgrounds.



Using the buddy system whenever you are enjoying outdoor activities like hiking makes it less likely that you will get lost, because you keep track of each other.

Youth Ages 13 to 15 Years

This is the age of many Boy Scout high-adventure participants at national and council bases. Those in this age group have more highly developed navigation and directional skills than 7- to 12-year-olds, and frequently become lost in groups while engaged in exploring or adventure activity. They rarely travel far if in a group and will usually respond to calls and whistles. Some may try “direction sampling” as they look for a familiar place. While they will attempt to find themselves, they often lack adult tactics and may panic and resort to irrational tactics. Places to search for this age group include tracks, trails, and shortcuts. Check with friends about any “secret” or favorite places, hideouts, or routes. Also be sure to search landmarks, high points, and water features.

Trained searchers and search managers know the characteristics of many more categories of lost subjects. They also know how people who are despondent or have developmental delays or cognitive disorders may behave if lost.

Practice Scenario 4

On August 2, a Scout troop from Iowa hiked to the search and rescue camp at Philmont Scout Ranch as part of their prearranged itinerary. Because one of the hiking leaders took a wrong turn, the group lost valuable daylight and arrived to the camp at dark. They pitched their tents, hastily ate dinner, and fell into their sleeping bags, exhausted.

At 7 a.m. the next day, a group of boys sharing one of the tents woke up to find that one of them, Tommy, age 13, was missing. The boys vaguely remembered that he had left the tent in the middle of the night, saying he had to go to the latrine. The boys fell back to sleep but later were awakened slightly when thunder rumbled and a light rain began to fall.

No one knows exactly what time Tommy left or what he was wearing, as it was dark, but most of his gear is in the tent and undisturbed. He had brought a soft pair of moccasins to wear as camp shoes, and they are missing. The boys walked to the latrine to look for Tommy, but there was no sign of him.

Tommy, who is a cross country runner at his school in Iowa, is known to be afraid of the dark. He has not been in Scouting very long, and this was his first time to Philmont.



Orientation and Navigation

Navigating in search and rescue requires the constant determination of distances, including distances the search team will travel and has traveled, distances within the search area, and distances to and from landmarks. The most important tools for any search and rescue team member are a map, compass, GPS unit, and the knowledge to use them.

Map and compass are fantastic tools and don't need batteries, but you must have a map of the area you are searching. Sometimes a reporting party will sketch a map of the area, which can be helpful. GPS units are great, too, as they can be very precise about your location and can carry lots of maps, but they require a power source.

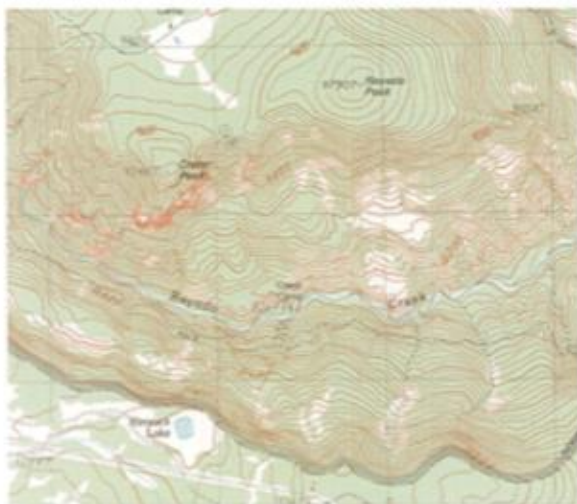
So what is the best answer? Use the map, compass, and GPS unit together.

Maps and Compasses

Several kinds of maps are commonly used in search and rescue. Online maps are popular but are limited because most portable computer devices are too small for the maps to be useful. Road maps, the kind you can pick up at a gas station or convenience store, are most useful in an urban search. Maps called *charts* are used in water-based search and rescue, and are readily available through nautical supply stores. The type of map that is most often used in search and rescue, especially in wilderness settings, is a United States Geological Survey (USGS) or topographic map.

Maps provide a lot of useful information in the margins. If you are using a map that was not printed by the USGS, double-check that the scale uses the same distance ruler; this is usually in the bottom margin. Latitude and longitude and usually the Universal Transverse Mercator (UTM) grids are along the edges of the map as well.

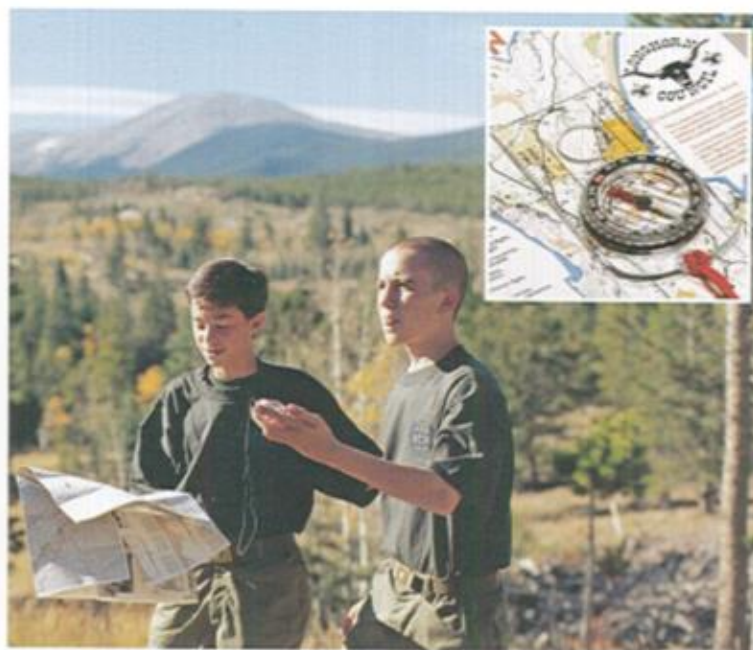
One of the most important margin notes is called the *map datum*; this is a reference to the base of information used to build the map. Most maps in the United States use North American Datum 1927 (NAD 1927) and the World Geodetic System 1984 (WGS 1984), which is also used commonly in GPS units. You need to make sure that the datum is consistent throughout your team and that you have communicated which you are using to the incident command.



Some additional helpful features include a declination scale or adjustment of some sort, a sighting mirror, and a clinometer for measuring slopes or inclines.

Using a map and compass together is a skill any searcher must have. Maps alone can be useful, as can a compass. However, their combined use allows searchers or rescuers to more effectively communicate and navigate with incident command's help.

Declination corrections are further discussed in the *Fieldbook* chapter on navigation and other sources listed in the resources section of this pamphlet.



Latitude/Longitude and Universal Transverse Mercator

Something common to all accurate navigation systems is the use of a method to indicate where you are. Saying "I'm by the house on the river" is a very imprecise method of orientation in search and rescue. Instead, the coordinate systems, or grids, most often used are latitude/longitude (or lat/lon) or Universal Transverse Mercator (UTM). Each grid type uniquely identifies each point on a map.

The grid most people are familiar with is lat/lon in which the world is divided into lines of latitude and lines of longitude. Latitude lines are parallel to the equator and divided into 90 degrees north and south. Longitude lines run from pole to pole and are divided into 180 degrees east and west.

More information about using a map and compass can be found in the *Orienteering* merit badge pamphlet, *Boy Scout Handbook*, and the *Fieldbook*.



In each case, the full designation is read hemisphere, degrees, minutes, and seconds. For example, the national office of the Boy Scouts of America is designated N 32° 53' 5.8" W 96° 58' 13.7". Lat/lon is often utilized in air and sea SAR operations and is understood worldwide.



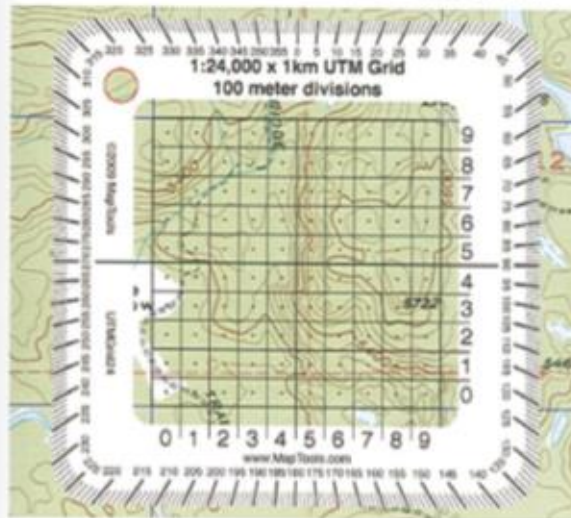
Coordinates for the Boy Scouts of America's national office in Irving, Texas, are N 32° 53' 5.8" W 96° 58' 13.7".

The grid used in most nonurban searches is the UTM grid. In this system, Earth is divided into 60 zones, each of which is 6 degrees of longitude and 8 degrees of latitude. The numbers across the top of the map are *eastings* and the numbers along the side of the map are *northings*. As you read a location on a map using the UTM designation, you read "right and up." In UTM terms, the BSA national office is located at 14° 6 89 852m E 36 40 358m N.

To find a location on a USGS topographic map, you will need to know whether it is a 7.5-minute map (also known as a 1:24,000 scale or quad map) or a 15-minute map. In most cases, it will be a 7.5-minute map. Once you have this information, you can start to estimate the location you want to find. A useful tool here is the grid tool or a corner ruler, both of which help you identify a point on the map by overlaying a clear plastic gridded template or ruler scaled to your map. If you don't have such a tool, you can still estimate your location somewhat accurately because each UTM square represents 1 kilometer by 1 kilometer and is divided into 10 100-meter segments. Distances are easy to calculate using UTM because it is accurate to 1 meter.

By starting with a UTM coordinate or an estimated location on a map, you can estimate your location using lat/lon coordinates by reading the side and top of the map. This method is approximate at best. Your two best options are to use a computer or phone application to convert the coordinates, or to use your GPS unit and enter the coordinates and switch from UTM to lat/lon and back as needed.

Why would you need to switch back and forth? In some instances, the subject may be using lat/lon and has given his or her location in that format and the search team is working in UTM.



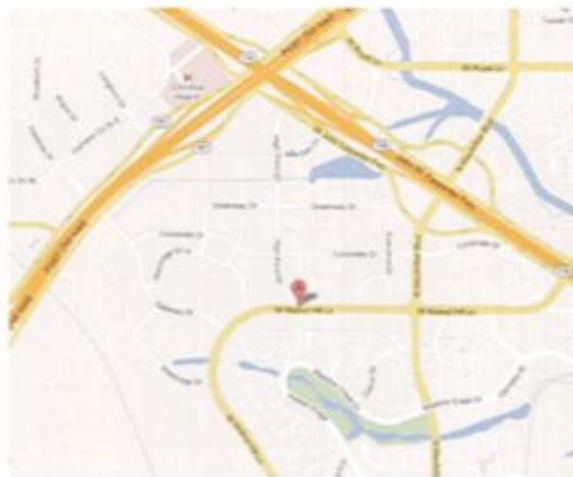
See the *Geocaching merit badge pamphlet* for more information about latitude/longitude and the UTM system.

GPS Units

Both lat/lon and UTM methods are common, and each has benefits and shortcomings.

GPS units have become standard navigation tools around the world and are very useful in search and rescue. One particularly useful feature that most units have is a track log that stores your location at regular, preset intervals while the unit is turned on. At the end of a search period, the incident base team can download that information into their computers so they know exactly which areas have been searched.

Note that, just like a map and compass, you must master your GPS unit prior to relying on it in the wilderness. Always carry the instruction manual with you. GPS units do have limitations, most notably battery life and "shadowing" of the satellite signals by trees, tall buildings, or steep hills and cliffs. They do not work well, or at all, inside buildings, tunnels, caves, and narrow steep canyons and require a straight line of sight of most of the sky (as that's where the GPS satellites are).



You can practice your GPS and map skills using an online mapping system such as Google Maps and others. A detailed topographic map and a Google Earth map used together make it fun.



Be sure to hold the GPS unit just like you would hold a regular magnetic compass, level and with the top of the GPS receiver pointing straight ahead (see the picture). Otherwise it will think it is going backward. When the arrow is pointing straight ahead, you are on the correct track.

A GPS unit can be easy to use. One of the easiest things to do with your GPS unit is to determine your exact location right now. The first step is to turn on the unit. The next step depends on your individual unit; in many cases the first screen indicates your current coordinates, while in other cases you will need to move through a menu or two. Your location will likely be noted in either lat/lon or UTM. To switch back and forth between these systems, you need to change the coordinate system on the unit setup screen. It is best to consult the owner's manual for the GPS unit you are using.



The technical details of using GPS units can be extensive. If you decide to purchase and use one, be sure to read the owner's manual. You can also refer to the *Geocaching* merit badge pamphlet or check the resources section.



Search Tactics

Search managers and teams use many tactics but always start by establishing the search area. This is called *confinement*, an effort to establish a search perimeter that encompasses the subject and beyond which he or she is unlikely to pass without being detected. Confinement may involve setting up roadblocks or trail blocks and posting lookouts of individuals in strategic locations on high ground. Searchers may build track traps and frequently check for footprints indicating that the subject has moved through the perimeter.

Barriers made of string lines, light sticks, or flagging tape may lead the subject to the searchers.

SAR personnel establish confinement by plotting on a map the PLS (place last seen) or LKP (last known point) and then drawing a large circle around that point to coincide with the distance an average person can walk in that terrain during the time the person has been missing. For example, if the subject



has been missing for one hour and the average person walks about 4 mph, the outside diameter of the circle has to be four miles from the PLS in all four directions. This theoretical search area is 16 square miles; after two hours it is 32 square miles, and so on. Within that circle the planning section chief identifies features such as roads, trails, streams, or ridges that can be considered natural confinement areas.

Where Do You Search First?

As hasty teams are being sent into the field to do quick searches, the planning section back at the incident base is busy formulating a more detailed search plan. One important task they will do is determine the probability of area.

The probability of area (POA) is the probability that the subject or clues leading to the subject are in a specific area. This is based on the terrain, time of day, subject, details of the subject's disappearance, and other factors. Teams use this information to decide where the subject is most likely to be and search those areas.

There is also a way to determine the probability or chance that the searchers would have found the subject or clues relating to the subject had the subject or clue been in the area searched. This is called probability of detection (POD). POD is usually expressed as a percentage value, i.e., "we searched our assigned area with a 50 percent POD." Many factors have to be considered, such as the terrain, weather conditions, experience level of the team, critical separation, and even past searches in the same area.

In a wilderness setting, achieving a 100 percent POD is next to impossible, but the goal is to always search—and sometime re-search—all areas of high probability until a POD of at least 85 percent to 95 percent is reached.



Determining Search Tactics

Search tactics are categorized as passive, where you make the subject come to you, and active, where you go find the subject. An **active search** is carried out by teams in the field in a deliberate attempt to find the subject or clues left by the subject.

A **passive tactic** that is often effective is an *attracting lookout*. A two-person team is sent to a high location to try to spot the subject's campfire or tent, or another sign that the subject may be in the area. The team may build a campfire or use strobe lights, whistles, air horns, sirens, or other signals in the hope that the subject will respond.



Information gathered during the interview and investigation phase of the search will dictate the first response. The subject may have shared his or her plan to hike to a certain place along a certain trail. An appropriate search method might be a *trail sweep* by a hasty team. Teams are sent out to search a subject's suspected travel route, a trail, a ridgeline, a creek bottom, or a forest road. Searchers must look very carefully close in and far out. They must look on both sides of the trail to detect whether the subject left the trail. Team members should walk beside the trail so as to not disturb any footprints that may be the subject's.

If the PLS is known but the direction the subject went is unknown, a quick perimeter search is done. This is also a tactic for *sight cutting*, or looking for clues that will help searchers find the subject's trail. Another fast, systematic search is where a team of five to six members checks a larger area such as a canyon, valley, or ridgeline using fairly wide spacing and good critical separation between searchers.

Critical Separation

How far team members are spaced apart and still able to search effectively is called critical separation. Here is how it works.

1. Place an object on the ground that bears some relation to the size of the subject being sought. For example, a backpack standing upright may be about the size of a small child. The vegetation and terrain should be similar to that in the area being searched.
2. The team walks around the object so that it is kept in view. The distance between two opposite searchers is the critical separation.
3. To make sure the distances are correct, after making the initial estimate, turn 90 degrees to the object and scan as if you are searching. If you can no longer see the object, you may have to adjust your critical separation.

During this type of search, team members do not walk in a straight line. Instead they wander around in a purposeful manner, stopping often to look around and check behind trees, boulders, and other objects. This is known as *purposeful wandering*. This is an important tactic, as it forces the searchers to stay focused and attentive so they don't walk right by the subject if he or she is unresponsive.

If these tactics yield no results, a highly systematic search using very close spacing and more team members (six to 12) may be ordered by the IC (incident commander). This search is often done in an area of high probability if the subject is expected to be immobile or where a valid clue has been found.

More clues will be found than belong to your subject.



Sound Sweeps

A very effective tactic that is often done at Philmont is a *sound sweep*. This tactic can often help locate a subject quickly.

To conduct a sound sweep, each searcher must have a radio and a whistle. They space themselves along the search area boundary at a distance of 500 to 600 feet, depending, of course, on the terrain and how far sound may travel. As they enter the search area, the team leader or incident base may transmit "whistle blast in five seconds" and then count down "5-4-3-2-1." All searchers blow their whistles simultaneously and then listen for a response from the subject. A modified tactic would be for the searchers, spaced closer, to call out the subject's name.

Searching at Night

Night searches are very difficult and present added hazards. They should only be done after the command staff takes into account the search urgency, the best tactics to be used, the probability of success, and the safety of the searchers.

People are often reported missing late in the day after friends or relatives have spent considerable time looking for the lost person with no success. Therefore, getting a rapid-response team into the field as quickly as possible to effectively use the last hours of daylight is crucial.

Advantages and Disadvantages of Night Searches

Some advantages of night searches are that dogs work better at night, tracks show up better when illuminated by flashlights, footprints do not dry up as quickly, human voices carry farther, and subjects usually hole up rather than travel at night.

A major disadvantage to night searches is that searchers have an increased risk of accidents because of the darkness. Other disadvantages include that it is more difficult to transport a subject if found, clues may be destroyed or missing, lights hamper searchers' night vision, and it is difficult for the team leader to see and guide team members. Additionally, the same area may have to be searched again in daylight.

Becoming Clue Aware

Scouts take pride in using Leave No Trace principles; however, it is almost impossible to be in the woods without leaving behind some evidence. Clues often are very subtle, and searchers need to be extremely vigilant to find them and determine their importance.

A simple footprint, a dropped article of clothing, or disturbed vegetation might just be the clue that leads searchers to the subject. It is more likely that a series of found clues will lead to the subject. Remember, there are many more clues out there than there are subjects.



Clues can be categorized into six broad areas:

- Physical —The subject's vehicle, lost or discarded items, footprints, scent
- People—Witnesses, family, friends
- Recorded—Trail register, summit log, trip plan, photo at an ATM
- Event—A light, campfire, signal, human voice
- Investigative—Information, often subtle, generated by investigative techniques
- Analytical—Probability calculations, lost subject behavior statistics, subject's personality profile, terrain analyses (such as identifying travel aids and barriers)

Finding a clue known to be left by the subject will often change the action plan and search tactics. Searchers must always be "clue aware" and should mark and record all clues. Teams should radio or phone the type of clue and its location to the incident base and make every attempt to preserve the clue without disturbing it. Clue locations should be precisely documented and surrounded with surveyors tape. As a Scout, you have learned to be observant of the things around you. These same skills apply to SAR as team members become clue aware.

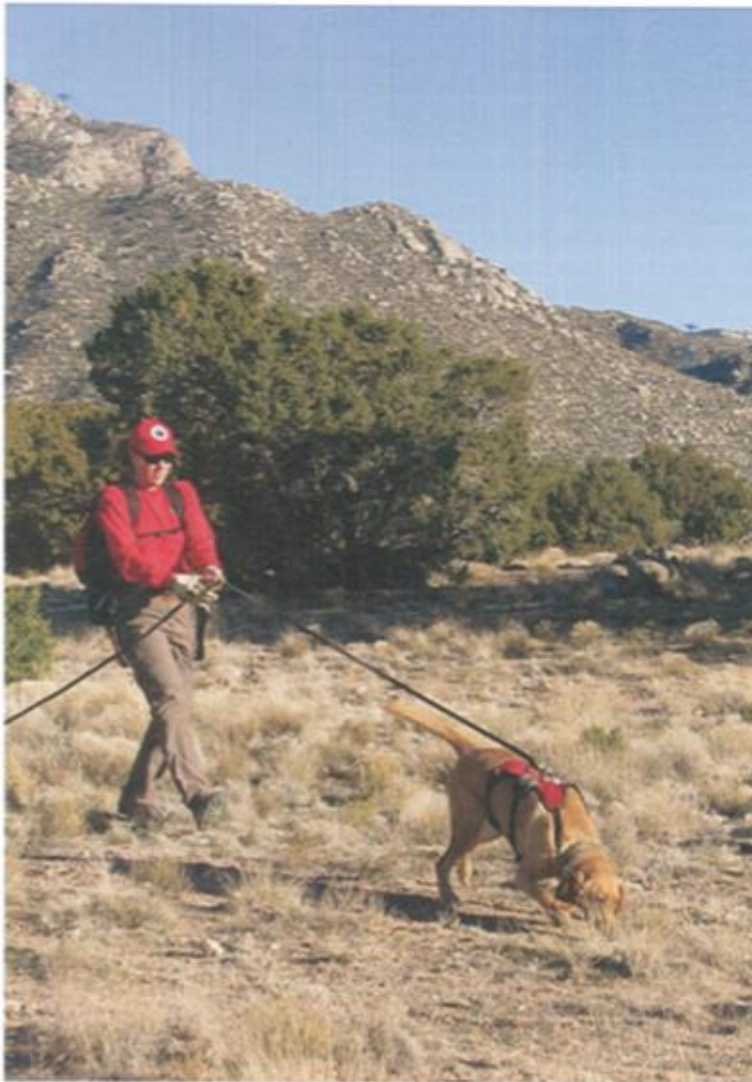


Practicing SAR Skills

An excellent SAR practice drill is one in which the IC (incident commander) writes a scenario and completes a lost person questionnaire, then scatters sample clues over a one- to two-acre area. Teams are briefed, using the scenario and interviewer, and then sent into the field to see how many clues they can find. Some clues will tie directly to the subject and must be considered valid clues, some will be bogus, and others are "unknown," meaning they may or may not relate to the subject. The team marks the location of the clue on a map and radios it in to the incident base where the clue is logged on a clue log sheet.

At the end of the practice, the IC debriefs the teams, and each discovered clue is discussed. The team decides whether each clue is real, bogus, or unknown. The IC who planned the activity will then inform the team about the validity of each clue.

Some clues last longer than others. A footprint may be blown away by the wind or washed away by rain in just minutes; a plastic wrapper may last up to 30 years.



Specialized SAR Teams

Now that you understand how searches and rescues are reported, who is in charge of them, something about the behavior of missing persons, who does the actual searching and some tactics they use, it is time to learn about some specialized teams and how they save lives in the woods and cities where their skills are used.

Search and Rescue Dogs

Search and rescue dogs are a valuable resource on a search mission. They can search large areas efficiently and determine which direction the subject went from where he or she was last known to be. SAR dogs work together with other SAR teams and can play a key role in the overall effort to find a lost person.

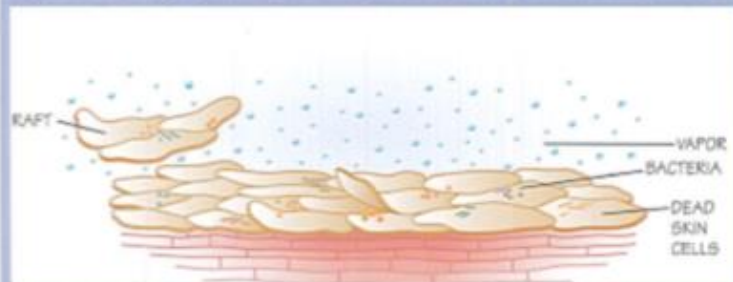
Search dogs tend to love socializing with people and other dogs. They are confident and not easily scared by sights or sounds. They have energy, stamina, agility, and are physically sound. SAR dogs almost always have a high drive for toys and food. Breeds well-suited for SAR include those from working dog bloodlines such as retrievers, herding dogs, hounds, and German shepherds.

Drive is the dog's strong desire to persist in certain behavior. Dogs are born with traits for drive that will develop as they mature, but dogs with high drive will show these traits as early as six weeks of age. These drive traits determine the dog's basic personality, so drive is only mildly influenced by training. A high toy drive dog, for example, may be obsessed by a ball, constantly pestering nearby humans to play a game of fetch or tug of war. Most SAR dog handlers use toys or food as rewards, so the dog needs to have a high interest in those things.



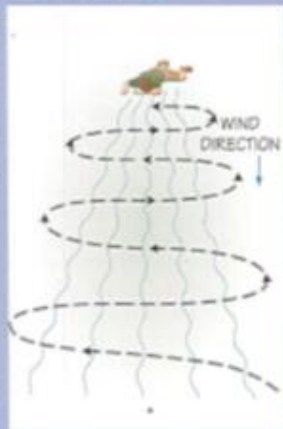
What Is Scent?

Humans constantly shed dead skin cells known as *rafts*, which are discarded from the body at a rate of about 40,000 skin cells per minute. Each raft carries bacteria and vapor representing the unique, individual scent of the person. Rafts fall all over our clothes, bedding, home, and car interiors, as well as outside. They are picked up and carried by wind currents, drift to the ground, and stick to vegetation. They combine with the smell of crushed vegetation along a person's traveled path.



Scent eventually dies as it dehydrates, so moist, humid conditions help preserve scent longer. (Scent can, however, be washed away by torrential rain.) If there is no wind, the scent drops off the body and lands nearby. If wind is present, the scent is dispersed downwind in a cone-like shape that is narrow at first but widens as the distance from the body grows. This is called a *scent cone*. The scent then catches on downwind vegetation, fences, and buildings.

Terrain features, vegetation, and wind conditions determine the path of scent dispersal. Heavy brush, light brush, woods, drainages, and slopes all affect scent differently. Over time, scent can travel and collect in areas far away from where the person actually walked. This creates an interesting, yet puzzling, "scent picture" for both the dog and handler to figure out.



Dogs make good searchers because they are incredible athletes and have such a good sense of smell. However, they tend to overheat easily, cooling themselves by panting. Drinking water helps dogs cool off, so handlers have to carry a lot of water. The SAR dog's training sessions and missions are usually scheduled in the cool of the day. Dogs detect scent mostly through their noses, so if they are having to mouth breathe (pant), they are less effective. Dogs use all of their senses to search, but their sense of smell is the strongest.

Dogs can be taught any of several ways to search, including area air scent, trailing, and disaster. Before responding to missions, the dog and its handler should have an active training schedule and current certification to qualify for SAR deployment. Most dog teams are affiliated with and deployed by their local state or county law enforcement organizations. Incident base staff must be familiar with the various search dog disciplines to give each dog team an appropriate search assignment. Each field-assigned dog team consists of a dog, handler, and at least one field support person who may also act as a navigator. As with all searchers, the handler must be fully prepared with appropriate equipment for the assignment, as well as extra water and food for the dog.

Area Air Scent Dogs

Area air scent dogs are worked off leash and usually wear a bell and glow stick at night, as well as an ID vest. They move away from their handler in search of the subject's scent on air currents and frequently return to keep track of their handler. The bell allows the handler to hear the dog moving about. The glow stick allows the handler to see the dog at night.

A typical search assignment for an air scent dog is to clear an area of land that is defined by natural borders, such as a stream or road. The area borders could also be defined by navigational markers such as latitude/longitude or UTM coordinates. This type of area-specific search assignment is also commonly given to ground search teams.

The handler is the team leader and must have a plan in mind to approach the search assignment. This search plan is determined by the terrain of the area, vegetation, and wind direction. The search area may dictate that the most efficient way to cover the area for a high probability of detection is to search in a back-and-forth pattern, called a *grid search*. In some cases, the topography may dictate that the search is best accomplished by following a ridgeline or searching a canyon floor.

Additional dog gear may also be required depending on the search conditions; this could include a dog first-aid kit, booties, and a cooling or warming dog coat.

Think of area air scent dogs as ground searchers with four legs and an excellent sense of smell.

An effective air scent dog responds to voice and/or visual directions from the handler and can be sent into specific areas. This way, the dog can cover areas that the handler may not be able to easily access. In ideal conditions, consistent wind direction and speed conditions can cause scent to travel long distances. This allows the dog to "clear" certain areas even though it may not have physically gone into the area. Air scent dog teams can also provide a hasty search along a hiking trail and adjacent area.

An air scent dog checks for scent mainly by keeping its head up and checking the wind. The dog needs to be downwind of the subject in order to detect him or her, and it is the handler's job to work the dog in a pattern that will achieve this. The handler watches the dog for changes in body language that indicate scent has been detected and modifies the search plan accordingly. GPS waypoints are often marked at areas of interest.

When the dog finds someone, it performs an alert (a trained behavior) that lets the handler know it has made a "find." Examples of an alert are for the dog to stay and bark at the subject, or for the dog to return to the handler and bark or jump on the handler, then return again to the subject (called a "recall/refind alert"). The type of alert the dog uses is determined by what comes naturally to the dog and what the handler teaches it to do.



Ginny, a Dutch Shephard, is the first SAR dog ever trained to assist with both surface and underground mine rescues.

Usually area air scent dogs are not scent specific, which means that they will find any person in the area, not just the subject of the search. They may occasionally find other searchers in the area, hikers, or bystanders. When this happens, the handler rewards the dog and tells it to continue to search. If the dog has been trained to be scent specific, a scent item of the subject's will be required. (See the following section for an explanation of scent items.)

Area air scent dogs work best on a mission where a trail or area needs to be searched, in moderate to cool temperatures, with light to moderate steady breezes. They work quickly and are good for night searches and searches involving nonresponsive subjects.

Trailing Dogs

Trailing dogs usually work on a long leash and harness, but occasionally work off leash. The handler starts the search where the subject was last seen, using a scent item from the subject, and the dog follows the general trail of scent that the subject left behind. Trailing dogs are scent specific, which means they search specifically for the subject and ignore other scents that may be in the area. Bloodhounds have traditionally been used to trail, but many breeds can be used.

A *scent item* is an article of clothing or another object that belonged solely to the subject and therefore is saturated with his or her scent. It should not be freshly cleaned or laundered, or have been directly touched by another person. It is given to the dog to sniff at the beginning of the search assignment so the dog knows who it is searching for.

Collecting a Scent Item

Scent items must be collected in a way that prevents the item from being contaminated by anyone else's scent. This is accomplished by using a one-gallon resealable plastic bag to collect the item. With the bag inside out, collect the item, then pull the bag over it. You could also use a stick or coat hanger to place the item in the bag. Scent items are collected by trained incident base staff or a dog handler.



Searching for a lost person is like putting together a puzzle based on many clues. These include information from onlookers and friends of the subject, the dynamics of the situation, and alerts or indications of interest from dog teams.

An appropriate search assignment for a trailing dog is to start at the place the subject was last known to be or to start at a footprint positively identified as belonging to the subject. Trailing dogs can also be used to *cut track*, which is to sweep through an area hoping to cross the subject's path. Once the dog has been given the scent item or footprint to smell and is on the scent trail, it can determine the direction of travel of the subject and will follow the scent path wherever it goes. Trailing dogs usually work with their noses close to the ground, unlike area air scent dogs, which hold their heads higher when working.

The dog generally follows the scent on the ground, rather than on the air currents. It may follow the actual footprint track or may parallel the track, depending on how the scent may have drifted since the subject passed through the area. As the scent trail ages, there is less scent available for the dog to detect due to dehydration of the subject's skin rafts.

Trailing dogs are scent specific, and a scent item or positively identified footprint are required. A nonresponsive subject and nighttime searching conditions do not pose a problem. These dogs are best utilized when the place the subject was last seen is known, so they can determine the direction of travel. Because scent dehydrates and deteriorates with time, it is best to deploy the trailing dog as soon as possible. They are most effective with calm wind conditions, light moisture, and cool temperatures.



Disaster Dogs

Disaster dogs are used to search areas of natural or human-made disasters, such as earthquakes, hurricanes, or destruction from terrorist activities, to find trapped subjects in piles of debris. Many of these dogs were deployed in the aftermath of the September 11, 2001, disaster. Most of these dog/handler teams are part of the FEMA Urban Search and Rescue system or belong to state teams that are similarly structured. They are certified by and deploy with their rescue teams based on directives from the federal or state government.

Search Teams

There are many kinds of teams that work in SAR. Ground teams and dog teams search on foot, while other teams search from horseback, ATVs, mountain bikes, or aircraft. There are also dive teams that search underwater; emergency locator transmitter (ELT) teams whose responsibility is to home in on a radio signal from a downed aircraft; and SAR support teams that provide communications support, radio relay stations, and food for hungry searchers.



Dogs trained to deploy to disaster situations must have all the qualities of previously described search dogs and must also be acclimated to stressful conditions. They must remain focused and not be distracted or stressed by their unusual search environments, which commonly include noisy generators, unnatural lighting, collapsed buildings, and large piles of debris with unstable footing. Many strong odors are present in a disaster setting, and the dogs work intensely. For this reason, they are worked for short periods such as 30 to 60 minutes, then rested and rehydrated before working another session.

Disaster dogs are trained to search in the same way as area air scent dogs. They are used off leash but without ID vest or collar to prevent entrapment by debris. They search areas of rubble and destruction, moving quickly to search and clear the area. The dogs are carefully trained in obedience and will search areas as directed by the handler from a distance. The required alert of the disaster dog is a "stay and bark" at the spot where live human scent is detected. While humans can search the rubble and call out to trapped subjects, the dogs are especially adept at quickly detecting those who are alive but nonresponsive. When a dog alerts, the handler approaches the dog and marks the spot with GPS waypoints and flagging tape. Rescue personnel are then brought in to the area to find and rescue the trapped subject.



Technical Rescues

Rescue as a part of search and rescue can occur in one of two situations. The first and most common is that a person in the wilderness or another remote area is injured or incapacitated such that evacuation to a hospital for further medical care is required. The second situation is that a person who has become lost or disoriented in a suburban or wilderness setting becomes the object of a search mission and, once located, requires evacuation for medical treatment. Rescue missions tend to be shorter in length than search operations but are much more focused and intense events that require good planning, quick decision making, and directed effort with the right resources to evacuate the subject.

Rescues should follow a procedure known as LAST:

- L = Locate
- A = Access
- S = Stabilize
- T = Transport

Locate the site of the emergency, safely Access the patient, medically Stabilize the patient, and safely Transport the patient out of the situation. Following this simple principle helps to quickly prioritize what needs to be done to accomplish the successful evacuation of a patient.

During the initial report of an incident requiring the rescue of a subject, information is often sketchy and incomplete. This forces the incident commander to assess probable scenarios and then make a plan to execute using resources that will evacuate the patient in the most efficient and safe manner possible.

Trauma Classification System

1st Priority (Immediate)—Patient who has injuries that are critical and needs immediate intervention by a medical provider and transport to definitive medical care.

2nd Priority (Secondary)—Patient who has debilitating injuries but does not require immediate attention.

3rd Priority (Delayed)—Minor injuries. These patients, often called “walking wounded,” can wait for treatment and can even be used in certain situations to help with the rescue effort.

The patient’s medical condition needs to be determined as soon as possible to dictate the urgency and resources needed to evacuate him or her in a prompt and safe manner. Patients are classified by applying a trauma classification system to their symptoms. Rescuers must have a high level of training (EMT or above) to be able to apply this system.

Dispatch as soon as possible a hasty medical team, which is a quick response team made up mostly of medical personnel. There should be a minimum of two medically qualified personnel (EMT, paramedic, physician’s assistant, medical doctor) to assess and stabilize the patient and report back to the operations section their evaluation of the patient’s condition and their recommendation for manner of evacuation. It is essential that the medical hasty team have good communications with incident base to keep the operations section advised of the mission’s progress. In certain situations, it is also necessary for the hasty medical team to have rope access and rescue capabilities, as many injured parties are in vertical terrain.

Helicopter Rescue

Critically injured patients may require immediate evacuation via helicopter. Once the operations section has determined the appropriate means of evacuation and has weighed the risk versus benefit of using air resources, the operations section requests the IC (incident commander) to call for launch of the aircraft. A general rule of thumb to decide whether a helicopter is needed to evacuate a patient is to determine whether the patient will die or lose a limb or eyesight. These cases warrant helicopter evacuation.



Helicopter rescues—while a vital SAR function—are not approved BSA activities.

Helicopters provide an excellent resource to assist in search and rescue operations in harsh or remote locations. Unlike fixed-wing aircraft, helicopters can operate and land virtually anywhere without the need for airports, runways, or improved concrete surfaces. However, the use of a helicopter requires taking many factors into consideration, the most important of which are available light, weather conditions, and the safety of the aircrew. Helicopter medical evacuations can be surprisingly hazardous.

When planning a helicopter rescue mission, it is essential that the IC also plan for a backup evacuation method in case the need arises. The most common of these is an over the ground litter evacuation utilizing a wheeled litter. This method requires at least 24 people making up three teams of eight people each to keep the litter moving at an approximate rate of 1 mph down trail. This method is also most preferred for less critical patients who may not qualify for helicopter evacuation.



For more information about litter evacuation, see the *Fieldbook*.



Rescue Hoist Operations

There may be situations when a helicopter will be unable to land due to terrain, obstructions, or other hazards. Some helicopters are equipped with a rescue hoist system. **See the helicopter hoist system depicted here.** This system allows the aircrew to hover the helicopter over a selected area, insert an aircrew member with the hoist, then extract the aircrew member and patient in the same manner. Helicopters that are equipped with rescue hoist systems provide the aircrews with more options to safely complete their mission. The aircrew will assess a number of factors when planning rescue hoist operations including weather, winds, temperature, altitude, and aircraft weight.

Technical or Terrestrial Rope Rescue

This is a specialty of rescue that deals with evacuating injured patients from high to low angle cliff faces, out of canyons, crevasses, or caves, off of snow fields, and out of industrial areas or damaged buildings. Rescuers who participate in this type of rescue must be proficient in rock and ice climbing and also have advanced levels of medical training to be able to manage an injured patient for hours in difficult terrain. This type of rescue takes many hours of training and practical experience to become proficient. There are many organizations in the United States that are accredited by the Mountain Rescue Association to perform such rescues.

Technical and terrestrial rope rescues are not approved activities for Scouts or Scout units.

Civil Air Patrol

All youth ages 12 to 18 may join the Civil Air Patrol (CAP) as cadets and receive education and training toward their certifications to participate in search and rescue. CAP is the official civilian auxiliary of the U.S. Air Force. CAP has three primary missions mandated by the U.S. Congress: aerospace education, cadet program, and emergency services.

Active membership in a local CAP unit will open the door to a variety of emergency services activities that include disaster relief efforts working with Homeland Security and FEMA (Federal Emergency Management Agency), communications support to operations both in CAP and in your community, and active support to SAR incidents managed by the U.S. Air Force Rescue Coordination Center or local authorities responsible for managing SAR incidents.

Some public service agencies charter Venturing crews that specialize in firefighting, law enforcement, and search and rescue. Venturing crews are open to young men and women ages 14 through 20 and function in a manner similar to a troop but frequently with a special area of interest.



Careers in Search and Rescue

The experience of helping others in need while combining one's passion for the wilderness and the adventures it offers may seem like a natural fit for you.

Search and rescue operations in the United States are primarily conducted by volunteer teams. Many of these teams are members of professional organizations such as the National Association for Search and Rescue or the Mountain Rescue Association. They usually, are run by local sheriff's offices or city or state agencies and may have paid positions. The Las Vegas Metropolitan Police Department Search and Rescue is a prime example.

The National Park Service also employs SAR personnel throughout many national parks, most notably Denali, Grand Canyon, and Yosemite national parks. Many of these national and state park positions require emergency medical, law enforcement, and fire/rescue credentials. They may also prefer certifications from organizations like the American Mountain Guides Association.

If you are thinking about a military career, you may want to look into the U.S. Air Force Pararescuemen (PJs) or Combat Rescue Officers (CROs). You may have heard the motto "That others may live." This motto originally came from the PJs, who are the only full-time special operations unit of the military that focuses solely on SAR.

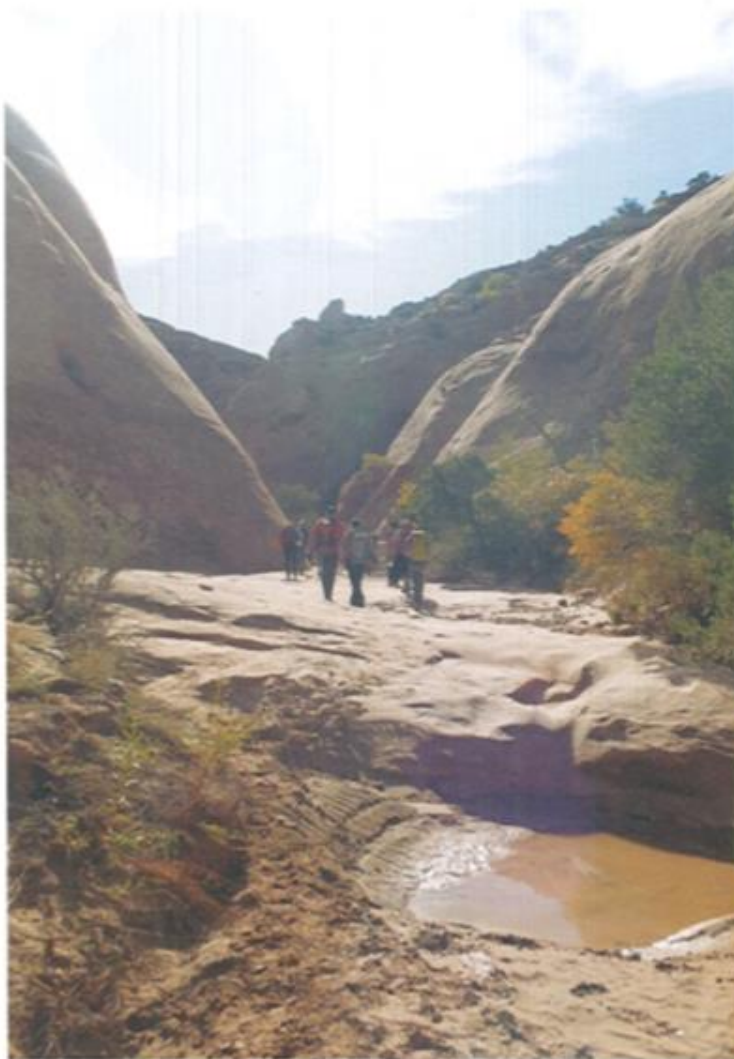


SAR careers also exist within fire departments and ambulance services throughout the United States. This depends on the capabilities and training of local resources. For employment with either a fire department or ambulance service, an EMT or Paramedic license is needed. A good example of a SAR ambulance service is the American Medical Response Reach and Treat Team. There are also many colleges across the United States offering degrees in Emergency Medicine, as well as some offering degrees in Austerity and Mountain Medicine, and Emergency and Disaster Management.

SAR careers dealing with the Incident Command System and emergency management can be found from the lobbying floors of Washington, D.C., to disaster zones such as areas hit by hurricanes or earthquakes. Many of these professionals lead urban search and rescue teams or Disaster Medical Assistance Teams (DMAT).

Outside of the United States, search and rescue is primarily provided by private entities that employ paramedics and mountain guides. One such group is the Alpine Rescue Center by Air Zermatt in Switzerland.





Search and Rescue Resources

Scouting Literature

Boy Scout Handbook; Fieldbook; Backpacking, Climbing, Emergency Preparedness, Fire Safety, First Aid, Geocaching, Hiking, Lifesaving, Motorboating, Orienteering, Radio, Rowing, Safety, Scuba Diving, Small-Boat Sailing, Swimming, Weather, Whitewater, and Wilderness Survival merit badge pamphlets

Visit the Boy Scouts of America's official retail website (with your parent's permission) at <http://www.scoutstuff.org> for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

Cook, Mike, Guy Kerr, Rick LaValla, et. al. *Urban Search Management for the Initial Response Incident Commander*. ERI Canada Inc. and ERI International Inc., 2004.

Eng, Ronald C., ed. *Mountaineering: The Freedom of the Hills*. The Mountaineers Books, 2010.

King, Rick, and Chuck White, eds. *Mountain Travel and Rescue Manual*. The Mountaineers Books, 2012.

Kjellstrom, Bjorn, and Carina Kjellstrom Elgin. *Be an Expert with Map and Compass: The Complete Orienteering Handbook*. John Wiley & Sons, 2009.

LaValla, Richard, Patrick Hood, Ricj Lawson, Norm Kerr, and Guy Smith. *Basic Search and Rescue Skills: A Practitioner's Guide to Search and Rescue*. ERI Canada Inc., 2007.

Letham, Lawrence, and Alex Letham. *GPS Made Easy: Using Global Positioning Systems in the Outdoors*. The Mountaineers Books, 2008.

NASAR. *Fundamentals of Search and Rescue*. Jones and Bartlett Publishers, 2005.

NASAR. *Introduction to Search and Rescue*. National Association for Search and Rescue, 2008.

Setnicka, Tim J. *Wilderness Search and Rescue*, 1981.

Online Resources

ICS Forms

Website: <http://www.fema.gov/emergency/nims/JobAids.shtm>

National SAR Plan

Website: [http://www.uscg.mil/hq/cg5/cg534/manuals/Natl_SAR_Plan\(2007\).pdf](http://www.uscg.mil/hq/cg5/cg534/manuals/Natl_SAR_Plan(2007).pdf)

New Mexico SAR Field Certification Study Guide

Website: http://nmsarc.org/resources/FieldCert_docs/StudyGuide.pdf

Search Urgency Chart

Website: www.eri-online.com/uploads/MLSO_Search_Urgency_Chart.pdf

"Suunto on How Not to Rely on Luck & Compass and Map"

Website: http://www.crew572.org/resources/map_and_compass/Suunto.pdf

Urgency Determination Worksheet

Website: www.k7rdg.org/ICSforms

Wilderness Survival Guide

Website: <http://www.wilderness-survival-skills.com/>

A Note About Unauthorized and Restricted Activities

The BSA's *Guide to Safe Scouting* states under "Unauthorized and Restricted Activities" that flying in aircraft as part of a search and rescue mission is an unauthorized activity for youth members. For complete information, see <http://www.scouting.org/scout-source/HealthandSafety.aspx>.

Organizations and Websites**Air Force Rescue Coordination Center**

Website: <http://www.1af.acc.af.mil/units/afrc/>

American Avalanche Association

Website: <http://www.americanavalancheassociation.org>

American Institute for Avalanche Research and Education

Website: <http://avtraining.org>

American Medical Response Reach and Treat Team

Website: <http://www.summitpost.org/amr-reach-and-treat-who-we-are-and-what-we-do/172226>

American Mountain Guides Association

Website: www.amga.com

Colorado Geological Survey

Website: <http://avalanche.state.co.us>

Federal Emergency Management Agency

Telephone: 202-566-1600
Toll-free telephone for literature requests only: 800-480-2520

Inland SAR School

Website: <http://www.uscg.mil/tyorktown/ops/sar/inland/default.asp>

Mountain Rescue Association

Website: www.mra.org

National Association for Search and Rescue (NASAR)

P.O. Box 232020
Centreville, VA 20120-2020
Website: <http://www.nasar.org/>

National SAR School

Website: <http://www.uscg.mil/tyorktown/ops/sar/default.asp>

National Ski Patrol

Website: <http://www.nsp.org>

New Hampshire Fish and Game Department Specialized Search and Rescue Team

Website: http://www.wildlife.state.nh.us/Law_Enforcement/sar.htm

New Hampshire Outdoor Council

Website: www.nhoutdoorcouncil.org

New Mexico Department of Public Safety, Search and Rescue Resource Office

P.O. Box 1628
Santa Fe, NM 87504-1628
Website: <http://www.dps.nm.org/index.php/search-rescue/>

New Mexico Search and Rescue Council

P.O. Box 3396
Albuquerque, NM 87190-3396
Website: <http://nmsarc.org/resources/certification.html>

Urban Search and Rescue

Website: <http://www.fema.gov/emergency/usr>

U.S. Air Force Pararescuemen

Website: www.pararescue.com

U.S. Coast Guard

Website: <http://www.uscg.mil>

U.S. Geological Survey

Website: <http://topomaps.usgs.gov>

Acknowledgments

The Boy Scouts of America thanks the following members of the Search and Rescue Merit Badge Development Team, who diligently worked to develop the requirements and content for this new merit badge.

Doug Palmer, chairman—retired, associate director of Program, Philmont Scout Ranch; New Mexico Certified Type II Field Co-coordinator/ Incident Commander

Mark Anderson—Eagle Scout; director of Program, Philmont Scout Ranch; field coordinator, New Mexico State Police Search and Rescue

Mary Berry, D.V.M.—founder, Sandia Search Dogs, certified trainer, Search and Rescue dogs in trailing, area air scent, cadaver, and FEMA disaster dogs



Nathan Lay—Wilderness emergency medical technician; paramedic; New Mexico Search and Rescue Team; health officer/chief of Support, Philmont Scout Ranch

Owen McCullough—Eagle Scout; associate director of Program, Philmont Scout Ranch; field coordinator, New Mexico Search and Rescue

Michael H. Ritterhouse—Eagle Scout; backcountry manager, Philmont Scout Ranch; instructor, National Ski Patrol; instructor, Wilderness First Responder

Gary D. Williams—Eagle Scout; volunteer search and rescue area and incident commander, New Mexico State Police; lead instructor, flammable liquids emergencies, New Mexico State Fire School



Jason Williams—Eagle Scout; program director, Paramedic programs, University of New Mexico School of Medicine; rescue leader, Albuquerque Mountain Rescue

The following individuals served as reviewers and contributors in a variety of capacities: Scott H. Chappell, program coordinator, urban search and rescue/hazardous materials, Division of (Florida) State Fire Marshal; Sid Covington, logistics manager, Philmont summer programs, Rick Goodman, retired, New Mexico State Police Search and Rescue Officer; Rick LaValla, president and senior consultant, ERI International Inc.; Roger Ramsdell, urban search and rescue consultant; Tom Richardson, University of New Hampshire Fire Department, retired; Lt. Cmdr. Wayne A. Stacey, Eagle Scout and USCG retired, boating education specialist, Program Operations Branch Boating Safety Division, Department of Homeland Security, U.S. Coast Guard, and Office of Auxiliary and Boating Safety; and John Van Dreese, director, Outdoor Adventure, Orange County Council BSA.

Thanks also to the National Association for Search and Rescue; Camp Bell staff, Daniel Webster Council; Chicago Area Council; Philmont NAYLE summer class of 2011, and Sea Scout Ship 911, Pottsboro, Texas, for their assistance.

Photo and Illustration Credits

Alpha Natural Resources, courtesy—page 76

Mary Berry, courtesy—pages 11, 35, 70, 72, 73, 77, 78, and 93

Sid Covington, courtesy—page 65

Federal Communications Commission—page 10 (*second from right*)

Federal Emergency Management Administration—pages 10 (*second from left*) and 14

Rick Goodman, courtesy—cover (*top right*); page 83 (*top*)

Google Maps—page 62

National Transportation Safety Board—page 10 (*far right*)

Philmont Search and Rescue Team, courtesy—cover (*bottom*); pages 80, 88, 89, and 94

Roger Ramsdell, courtesy—pages 66 and 86

Tom Richardson, courtesy—page 18

Stockphotosforfree.com, courtesy—page 19

U.S. Fish and Wildlife Service/Luther C. Goldman, courtesy—page 44 (*coral snake*)

U.S. Forest Service—page 10 (*far left*)

Wikipedia.org—page 13 and 44 (*copperhead, rattlesnake, and cottonmouth moccasin*)

Jason Williams, courtesy—pages 9 (*top and center*), 27, 36, 38, 83 (*bottom*), 84, and 90

All other photos and illustrations not mentioned above are the property of or are protected by the Boy Scouts of America.

John McDearmon—pages 34 (*all*) and 74 (*both*)