

Introduction to Human Tracking for Search and Rescue Volunteers

Part 1 — What Constitutes a "Sign" and the Importance of Being "Track Aware"

As Search and Rescue volunteers, our goal is to help recover a lost individual. But it's important to understand that we are not just looking for a person. We should be looking for any physical indication that the lost individual has left behind. We should be looking for "Sign."

So, what is a sign?

Sign is all evidence, not limited to footfalls, of a person's passage or presence.

Easy to see signs might include:

- Discarded clothing
- A lost hat
- A water bottle
- Candy wrappers

Harder to notice signs can include:

- Broken twigs
- Bruised vegetation
- Compressed leaves

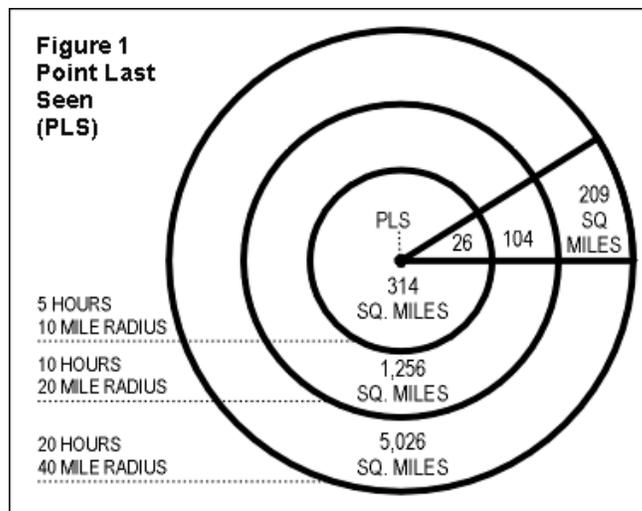
Can you see the signs in the picture to the right?
It's there, but it's hard to see with an untrained eye.



Field trainings are designed to change how you think about what constitutes a sign, and to train your eye so that you'll see what might otherwise be invisible to you. That way you can understand the patience and concentration it takes to notice a sign in the first place. And hopefully, you'll be a better Search and Rescue Volunteer for the experience, because on a real search, finding a sign that you might otherwise overlook could mean the difference between life and death for the subject of the search. Simply put, the importance of you being "track aware" could someday save a life.

Part II — Subject's Point Last Seen (PLS) and Track Identification

By the time we are called to search, the Deputies or initial responders will have established the place that the subject was last seen or known to be. The "Point Last Seen" is often abbreviated PLS. Identifying a *point* last seen and a direction traveled by the subject is very important in that it helps to concentrate the search area as shown in Figure 1. *The average search can take up to ten hours from the time the subject goes missing to the time searchers are in the field. This is because typically the family can spend up to four hours searching before calling for help. Then the sheriff's department has to spend some time verifying the search. Then there is time spent getting the team*



together and transporting to the search. Plans must then be setup and teams deployed. During that time the subject is traveling. A typical person can easily travel at two miles an hour. Two miles per hour for ten hours can potentially have the victim traveling 20 miles. This equates to a possible search area of up to 1,256 square miles. That's a VERY tough search. If a direction of travel can be established from the point last seen the search area can be reduced to something like 104 square miles. Still a large area but considerably better than 1,256 square miles. So, establishing this direction is of paramount importance.

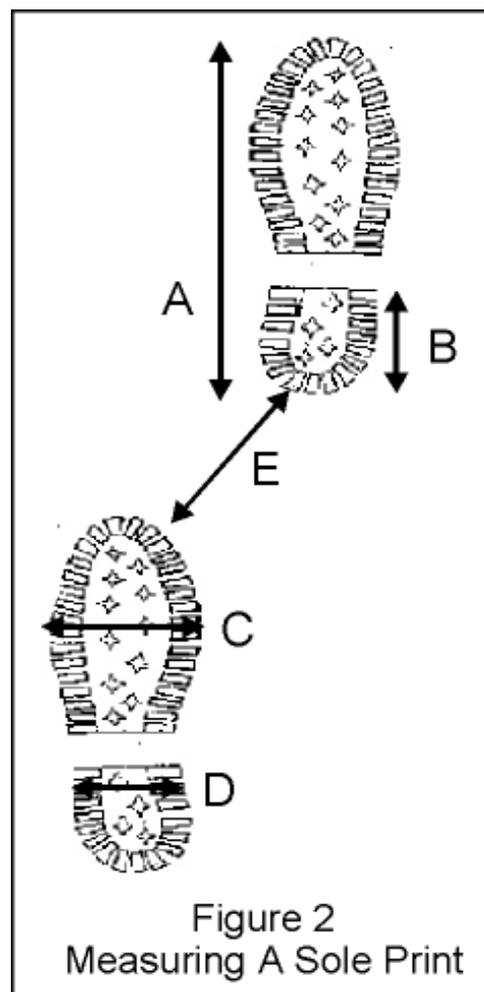
The initial responders will also have developed the most complete description of the lost subject(s) as possible. That description will include the subject's sex, age, size, weight, hair color and clothing worn. With luck, the description will include a description of the type of shoe the subject was wearing and maybe even a drawing of the sole or lug pattern. A description of the shoe type and size is helpful to understand what type of track to look for in the field.

If a good footprint is found a detailed drawing of the print would include the following measurements (See Figure 2):

- A) Overall length
- B) Length of heel
- C) Width of the ball of the foot
- D) Width of the heel

The reasons to make a detailed drawing of the footprint include:

- Possible use as evidence
- Helping you to remember it so you can communicate information about it to others.
- Allows other teams to know what they are looking for



Once a set of tracks is found in the field the tracker can measure the stride interval (E, Figure 2), which is the distance between the tip of the toe of the first print and the back of the heel of the following one. The stride interval can be marked on a "tracking stick" and then measured repeatedly to help find the most likely location of next footprint. This area is called the "Prime Sign Area"

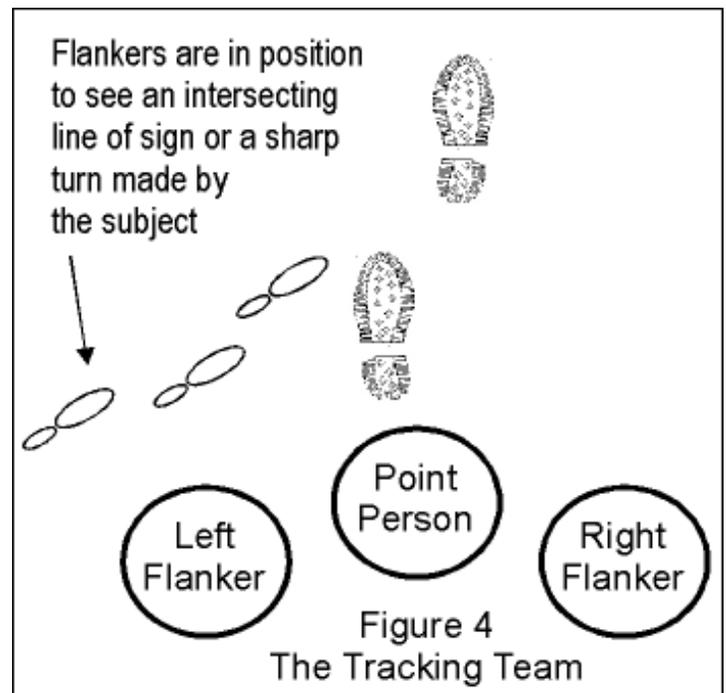
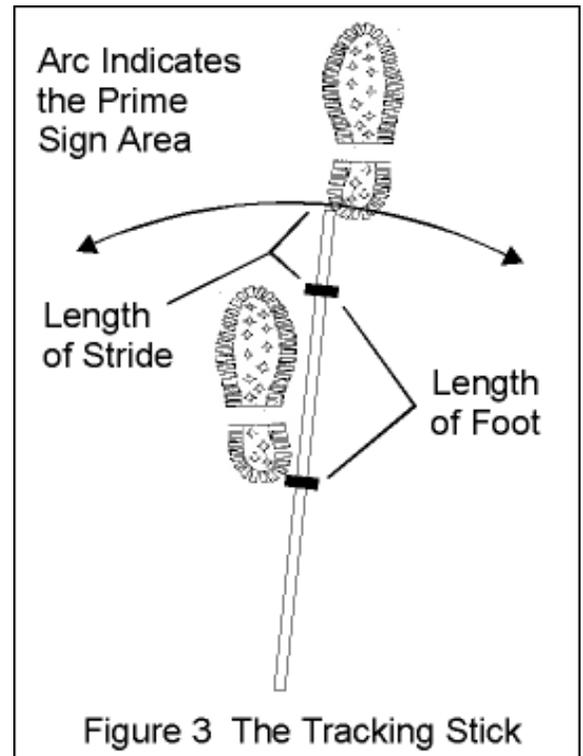
Use of the tracking stick is shown here in Figure 3.

**Additional information on The Tracking Stick and how to use it can be found on Pages 7 and 8.*

Part III — Teamwork, What to Look for and Training Yourself to See a Line of Sign

The preferred tracking team is a three person team consisting of a point person in the center and two flankers walking or crawling slightly behind. (See Figure 4) The flankers remain slightly behind the point person in order not to contaminate any unfound tracks that lie ahead. If the subject changed directions having the flankers slightly behind decreases the chances of contamination.

The point person swings their tracking stick to the next likely location of a track and the team works to identify a footprint. Some prints will be obvious and others are not. Each time the team agrees that they have a print then one of the flankers tears a piece of flagging tape and marks the heel of the print by pressing the tape into the ground. The team then moves forward in search of the next print, taking care not to damage the last marked track. The team should periodically rotate the person on point to provide a change of pace and a change of position. *Because of the high level of concentration the point person must maintain, they will tend to tire quickly.* Anyone on the team who needs a break should speak up as your eyes will need a break *periodically*. Trackers will be working close together in uncomfortable positions, terrain and conditions. Good honest, communication, and a positive attitude can be critical to working well as a team.



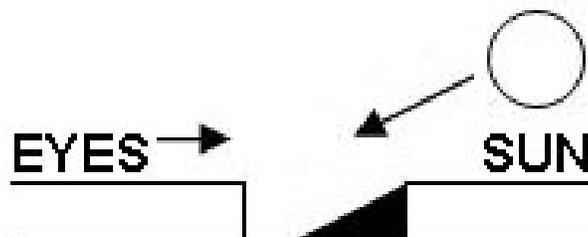
What to Look For

You'll find that a footprint in the woods rarely looks anything like the idea of a footprint that you have in your mind right now. It took some work fluffing up the soil in this picture (Right) to make a full, easily seen footprint. Put that perfect footprint out of your mind. That's not how they look in the field.



A footprint in the woods might consist of the curved impression of a "heel strike" on some decaying leaves, an area of "compression" including some tiny plants that are crushed, broken or bruised, a pebble dislodged from where it sat for years, or a little bit of soil churned up from a toe scraping the ground as it moved forward towards the next step.

Observe the shadows in the footprint photograph above and then look at the direction of the sun diagram (below). Looking towards the light source will help you to see a small ridge that might otherwise be difficult to see looking more from the side of the light source. This concept is most important when tracking at night with a handheld flashlight. Oblique lighting is the process whereby a flashlight is held horizontally and parallel to the ground while shining the beam at the suspected track. The light angle is moved to accentuate the sign detail by creating artificial shadows.



A glossary of tracking terms having to do with sign and indicators of a foot strike:

- **Aged Vegetation** - looking for a known amount of decay on damaged vegetation
- **Broken Stems** - branches and twigs
- **Bruised Vegetation** - if a plant has merely been bumped it may show a bruise even though it didn't break
- **Compressed Areas** - caused by the weight of a foot, will be mostly focused at the heel and ball of the foot
- **Continuity of Sign** - The evidence of footfalls is in unbroken sequence and spacing
- **Disturbance** - any disturbance that could indicate a footfall. Disturbed leaf litter, animal droppings or soil
- **Dislodged Sticks or Stones** - any object dislodged from where it had been for a long time will leave a sign
- **Embedded Object** - a stick or pebble embedded into the ground or underlying vegetation by compression
- **Grass Trail** - vegetation that is turned, flipped or twisted towards the direction of travel
- **Kick or Toe Kick** - a depression with debris scattered by a footfall and then movement of the foot pushing off towards the next step
- **Light Angle** - looking from one side a slight depression will show a shadow but not from the other. Another reason to work in groups of three
- **Line of Sign** - same as Continuity of Sign above
- **Oblique Lighting** - a process whereby a flashlight is held horizontally and parallel, low to the ground while shining the beam at the suspected track. The light angle is moved to accentuate the sign detail by creating artificial shadows. Used in low light or dark conditions.
- **Prime Sign Area** - the area where the next footfall should appear, found using a properly set up tracking stick
- **Scuff mark** - dragged debris or scraped surface from a dragging toe or a slip or turn while stepping
- **Shine** - vegetation that has been stepped on will often appear to shine by surfaces being turned in a uniform direction
- **Signature track** - unmistakable footprint evidence
- **Stride interval** - the distance between the tip of the toe of the one footprint and the back of the heel in the following one
- **Toe Dig** - indented mark made by the toe in a normal walking motion
- **Tracker Burnout or Blindness** - what can occur after tracking too long

(Bruised and aging ferns with broken stems provide enough sign to easily identify a foot strike - right)



Good Teamwork Equals Better Tracking

While tracking you might find many of the indications listed in the Tracking Terms Glossary in one footprint. Or, you might find only the slightest hint of one of them. Teamwork will be critical for two reasons.

- 1) In difficult terrain only one team member may have the right angle to see a sign, so it is important that everyone contribute to the best of their ability
- 2) There are decisions to be made, for example: Is it a track or not? Do we go on, or do we go back to the last track we were sure of? Should we take a break?

By focusing everyone from three different angles on the "Prime Sign Area" determined with a tracking stick, the team will eventually find some indication of a footfall. Then you work it as a team to find as many items as you need as a team to convince yourselves that you have a track. If you don't find anything else after a focused team examination you must decide as a team to go back to the last track and start the process again.

It is helpful now and then to stand up and look back at the marked "line of sign." That is the line created by flagging each heel print that indicates the path the subject has traveled.

Natural barriers, like a fallen branch or a large puddle can create a quick change of direction. The goal of the tracking team is to move along, marking the line of sign as fast as possible while remaining sure that you are on the right track.

(Right - a footprint in the sand)

Finding an obvious footprint in the sand or mud after tracking through difficult terrain will be a welcome sign that you are on the right track.



Of course, the ultimate goal is to recover the lost individual.

Your knowledge of tracking and an awareness of what constitutes sign can make you a more effective search and rescue volunteer in the field.

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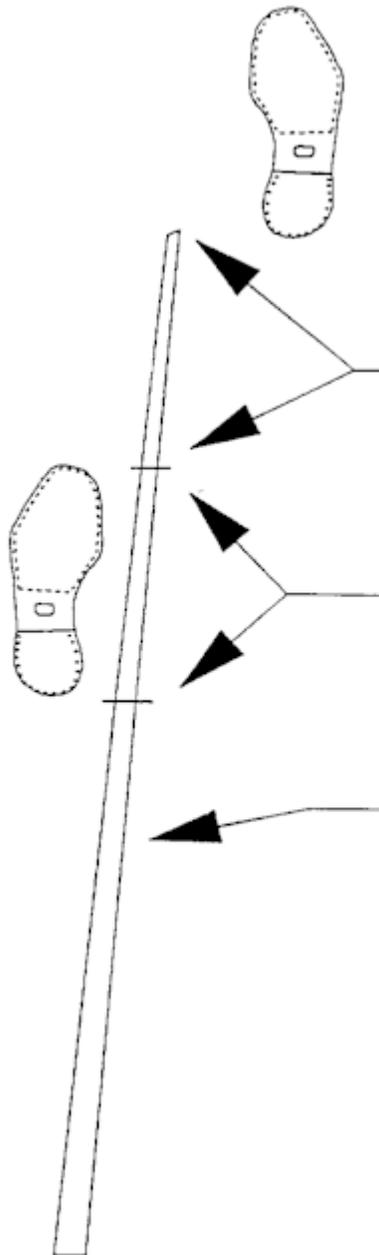
Use freely for any not for profit Search and Rescue Volunteer Training

** any additional notes added to the above material was indicated with italics.*

Tracking Tools

Measuring With Your Tracking Stick

THE TRACKING STICK



STRIDE measurement
from heel to toe

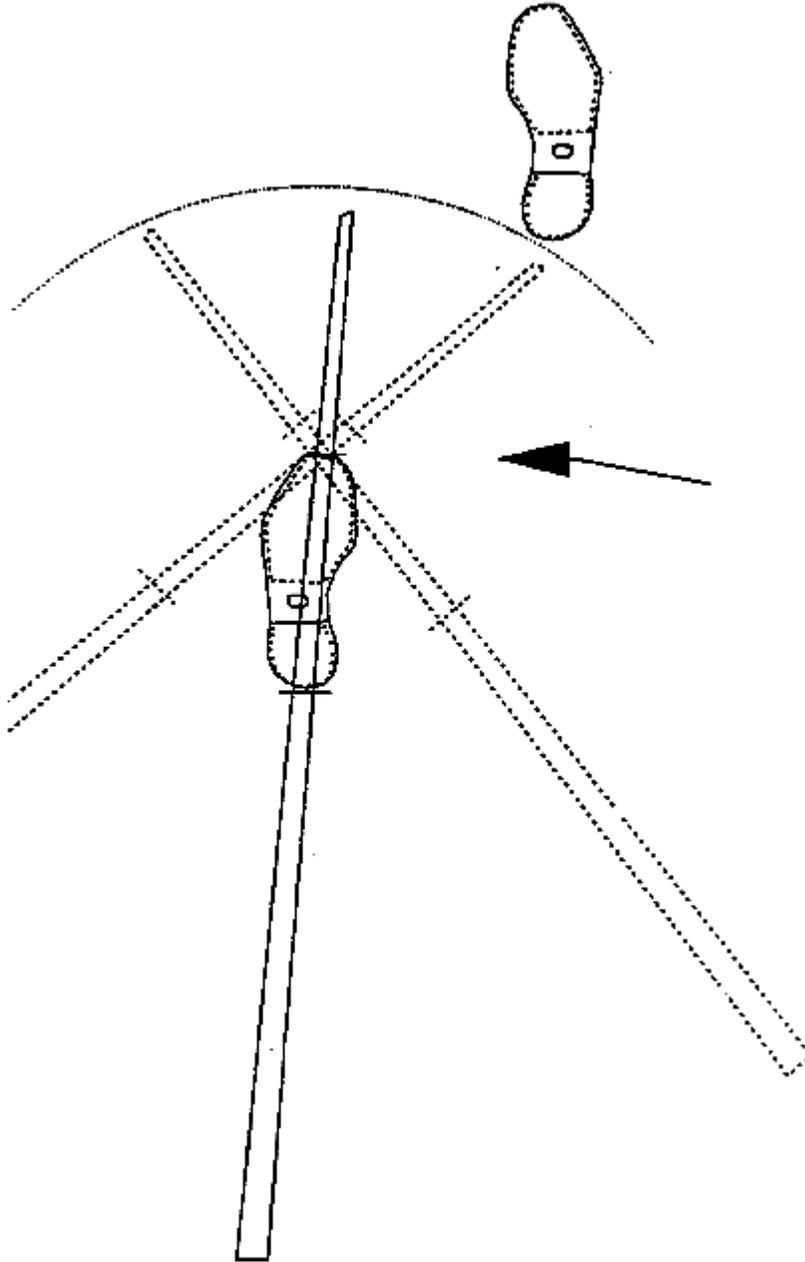
FOOT measurement

Rubber bands, Rubber "O" rings or other material is used to keep the measurement. Electrical tape is another excellent choice for your tracking stick, it adheres well and won't slip. Rubber bands, for example, can move up or down and throw off your measurements.

TRACKING STICK

Tracking sticks are one of the most important tools to the tracker. They are necessary to measure stride and footprint length. An adjustable, telescoping **trekking pole** is a great multi-use tool for this purpose. There are also tracking sticks made specifically for tracking. A tracking stick can also be made from anything you have available to you. A branch made in the field, a ski pole etc.

USE OF THE TRACKING STICK



Pivot the stick at the heel in an arc, this will allow you to concentrate on the prime sign area, looking for the heel of your next footfall.

Caution: Ensure tracking stick is held above the track to prevent contamination or destruction of sign.

To Measure and Mark

Additional tools to have at your disposal are:

- **Measuring tape** to measure the actual length of the print, the width and length of the heel and the toe. A flexible sewers tape or similar works well
- **Flagging tape** to mark and protect the track so others don't step on it and to make it easily seen by other field teams that might come along later
- **Sharpie pen** to write on that flagging tape. (the date, time, your team #, name, etc., whichever may be requested by your team leader and/or IC)
- **GPS and map** to mark the coordinates of tracks or clues. You will need to have these available to report to IC.
- **Notepad (and/or tracking card) and pencil** to make a drawing of the print and take additional notes
- **Small mirror** (which can double as a signal mirror) to redirect natural light across sign when the sun is high. Your compass mirror will work for this.
- **Flashlight**
- **Digital Camera** can be used as an “additional” source of recording sign.



All of this should be in addition to the rest of your 24 hour pack gear.\

The picture on the right was taken by Scot Woodland during a night search for a local missing subject and is an excellent example of the effects of proper flashlight angle on sign, and the value of your digital camera.

The flashlight was held horizontally and parallel, low to the ground while shining the beam at the suspected track. The light angle was moved to accentuate the sign detail by creating artificial shadows.



Locating a Clue or Track

Once a clue or track is located it should be carefully approached and inspected by “one” searcher who would perform initial assessment and measurement if so directed.

Documenting and Marking the Track

As soon as a reliable (or at least probable) track is located, **flagging tape should be used to make a “box” around the find and kept far enough away so as not to disturb. In addition, tape should be tied above ground level to allow identification of the location from a distance.** A sketch should be made of the print, and certain notes should be taken by all members of the team. An additional aid in marking sign is the method of placing a small piece of colored tape next to the heel of each step. In so doing, you can look back and see where each step was taken. This is especially helpful in criminal cases when photographs are needed.



Caution: do not place any marks or materials for marking in the actual foot impression, this destroys and renders useless potential vital evidence.

Mark the location as a waypoint in your GPS, write the UTM coordinates in your notepad to have them ready for transmit.

NOTE: Expert trackers seldom see perfect footprints, called signature prints, but do their tracking following partial tracks, flat spots, scuffs and bent vegetation. These slight indicators are what trackers call “sign.” It is impossible to say how far a tracker might have to follow sign before s/he finds a signature footprint that recalls markings that positively identify the person sought, but when these tracks are found, they should be uniquely marked. Hence the importance of boxing all the way around the print with flagging tape and also using brightly colored tape above ground level such as on a tree, shrub or bush, to allow identification of the location from a distance.

Using proper radio protocol, contact IC, identify your team and request them to make ready to copy coordinates. Using our 5 x 5 format, transmit same to IC. Speak slowly and clearly, first for Easterly, then Northerly. Use proper sign out procedure.

Sketching a print

When sketching a print it should carefully note and reflect every visible detail. Written notes of measurements and appearance will greatly aid the sign print description by radio for comparison by other teams. **NOTE:** When sketching a print, draw **ONLY** what you see on the ground. Later you may find more sign which may show more detail and you may then add to your sketch.

Because you may have to describe the track to others, or even eventually in court, this documentation should be very detailed, including the following information:

- **What is the size of the print?** Take careful measurements:
Overall length – heel to toe Length of heel
Width of the ball of the foot Width of the heel
- **Is it a right track or a left?**
- **Is it a flat track without a heel, or is there a heel and toe?**
- **What is the shape of the track?**
Is the toe rounded, pointed or square?
Is the leading edge of the heel straight or curved?
Is the instep high or low?
- **Are there any unique features, like worn spots, cuts or breaks for example?**
Anything that makes the track stand out & distinguishes this print from all others
- **Can you tell anything about the person's gait?**
Toes in or out? A limp?
Deep heel or toe dig?
- **Does the print look like a tennis shoe, a work or hiking boot, a street shoe, sandal etc.?**
- **What is the sole pattern?**
Does it have a border? Does it have labels, numbers, nails or stitching?
Are there lugs, bars, ripples, diamond, herringbone or other shapes?
Does the pattern have circles or semi-circles, arcs, stars, suction cup circles, bars (straight, curved, diagonal)?



If a print is found, again using proper radio protocol, contact IC and request the description and dimensions reported by the tracking team if available. If you feel it would be of benefit to request a tracker be sent to your location, do so at this time. After completion of these tasks, continue the search in your assigned area.

NOTE: When requested, in regards to print description for radio communication, keep your initial descriptions simple regarding type of shoe, with/without heel, pattern etc. The only measurement information with which you should tie up the air is overall length of the shoe, and if it has a heel, the length and width of the heel. The rest of your measurements should only be transmitted after IC has requested further detail or someone has found a track which they feel matches your initial description.

Remember it is far more communicative to tell a person that the track has a circle in the heel "about the size of a quarter" than to tell them it contains a circle "5/16 inches in diameter". It is far more useful to tell them that lines are "about the thickness of a match stick" than to tell them you have lines "1/8 inch thick".

Tracking cards like the one to the right provide spaces for all valuable information. Though they are not necessary as your notepad will suffice, it is very helpful to carry a couple in your pack. They are available in the QRV.

Universal Tracking Services Inc.

TIME: _____ _____	* LOCATION: _____ _____ _____ * SUBJECT HEADING: _____ * BASIC TYPE _____ * PATTERN _____ DIMENSIONS - OVERALL: * L _____ W _____ HEEL: L _____ W _____ STRIDE (TOE TO HEEL): _____ GROUND: _____ REMARKS: _____ _____ _____ _____ _____
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* REPORT TO BASE

Signcutting:

Member of a tracking team

If you find yourself as a member of a team with highly trained tracking resources such as signcutters or trackers, you should perform according to the requests of the personnel with more experience. You can usually offer another set of eyes to look at, or for, sign or assist in team functions such as navigation and/or communications. You should know that there are times when learning can take place and times when questions may only distract another searcher. Regardless of training levels, it is usually beneficial for more than one trained tracking person to be on a search team. The detection and interpretation of sign can, and should, be a team effort (having someone to discuss findings and interpretations with) rather than done by just one person.

Signcutting Basics

When initially cutting sign in an area, or when tracking becomes particularly slow, trackers can cut sign in a perimeter around an area where there is a good chance the subject has been. The purpose of such an effort is simply to discover sign at a farther distance from the last sign. If this perimeter team can positively identify the track and direction of travel, they can become the step-by-step team and allow the rear team to perimeter cut around them. The perimeter cut can range from several yards to several miles, depending on the terrain and how long the victim has been missing.

The shape of the perimeter can be square, triangular, circular, or any shape. It can even follow compass headings. The only requirement is that, no matter which shape is chosen, the loop must be completed. Two trackers can cut sign in opposite directions, meeting to close the perimeter, or one team can cut sign continuously until they reach their starting point again. If no sign is found, consideration should be given to the fact that no one has entered the area.

Track Traps

Sign is most easily seen where the environment enhances what we seek. Tracks are far easier to discover and identify when there are set in moist sand or firm, moist mud. If we identify areas such as these that allow for easy signcutting, we can use them to our benefit. These and similar areas, are termed natural or man-made "track traps".

Some examples of natural track traps are muddy areas, sandy areas along river and creek banks, steep embankments, fields of high grass, and dusty trails and roads. **Do not overlook the sides of paved roads.** Traffic on paved roads tends to produce a light dust that shows sign easily.

Some examples of man-made track traps include plowed fields, firebreaks, dirt roads, construction sites fences, or even a small area that was cleared purposely in order to catch a good print of anyone passing (track trap).

Being Track Aware.

Any track or sign is considered evidence until proven otherwise. Treat all tracks and sign as if it were positively identified as that of the person being sought. **Once a track or sign has been destroyed, it cannot be reconstituted.** It is lost forever. The destruction of a track, clue, or any sign not only chips away at the finite body of available information, it reduces the chances of meeting your objective. If that objective is finding a lost person, destroying tracks, clues, or any sign can literally mean the difference between life and death.

Beyond simply finding and interpreting sign, a tracker is obligated to protect it. Remember, any clue is important, no matter how small or seemingly insignificant. **Do not move from one place to another without being track aware.** An untrained person stepping on a good sign or track is unfortunate. A tracker or searcher doing the same is inexcusable.