



SIGN AND THE ART OF TRACKING

A GUIDE TO SUPPORT LAW ENFORCEMENT TRACKING AND ANTI-POACHING OPERATIONS

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Sign and the art of tracking – a guide to support law enforcement tracking and anti-poaching operations

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Preface

This manual is intended to provide law enforcement officers, special forces operators, search and rescue teams, and national park rangers with an additional tool in learning how to track poachers, criminals and lost subjects and to gather intelligence on criminal activity. It is also intended to teach law enforcement officers and rangers the importance and existence of evidence related to both tracks and sign on and in surrounding crime scenes, especially related to anti-poaching operations. Furthermore, it is designed not only to enable them to follow, locate and apprehend suspects, but also to a secure required evidence for prosecution and especially avoiding destroying or contaminating evidence in the process.

The photo guide is a complement to Jack Kearney's book *Tracking: A blueprint for learning how*, taking tracking onto a wider range of users and with additional experiences from various terrain and climates included and should be used in conjunction with courses. A professional tracking instructor is extremely important for faster and more accurate training. It takes time to learn how to see sign.

Tracking, primarily using visual sign, but also smell (olfactory), fingertips (tactile), various signs in nature, and predictions of movements, is probably the ultimate bush skill that can be acquired. However, unlike believed by many no-vides, it is not a skill restricted to a few indigenous "supernatural" trackers, but something entirely practical that can be acquired by everyone, given the training, time and required interest to learn. As said by Jack in his first book on tracking, "Tracking is no more difficult to learn than playing the piano. However, it is not one iota easier neither".

Tracking is not the solution to all problems in law enforcement, investigation, search and rescue or patrolling, but it is an additional and extremely valuable tool in your tool box that in many instances provides by far the best and most accurate option, enabling you to allocate and optimize use of other resources available. Tracking can multiply the efficiency of staff by tenfold, or even a hundredfold in search by identifying a sector to search in. It is also cheap and strengthens your most valuable resource – namely the staff. It is also an ancient skill updated with modern tactical methods and crime scene investigation methods. In the SOP's ahead we also provide examples of use in combination with K9 patrols, to increase mutual efficiency. In today's World of advanced technology, a well-trained combined K9 and tracker team is the most



efficient search team that can be applied. Tracking is not substituted with technology such as UAV's (Unmanned aerial vehicles), satellites, movement- and thermal/IR sensors. Bush and insurgent wars worldwide have shown again and again that heavily equipped super-tech armies are beaten by simple tactics, and "That it is not what you see but what you think you see – and what you don't" with many guerillas, poachers and criminals being experts in illusion techniques. However, everyone leaves behind sign – also when they are not watched – and sign is extremely difficult to falsify. It can take you to the very doorstep.

A single tracker that points out a direction or sector of a fugitive, can within minutes have saved the work of hundreds of personnel trying to catch a glimpse of the person in any direction, and thus help optimize the use of resources in the search. He or she may also be able to deduct much more precisely what happened at a crime scene

of a homicide, a rape or just a burglary, or provide information on numbers, level of training and even origin based on evidence from type of camp characteristics, spilled food items and movement patterns. A trained tracker can quickly discern from movement patterns also characteristics about the subject, although this is at the more experienced level.

Tracking is no mystery, but plain practical skills that can be acquired through training like anything else. We hope that this manual helps bring some basic knowledge out to a broader audience to once again create awareness on one of the oldest and advanced skills and its application in law enforcement, investigation, search and rescue (SAR) and reconnaissance. A team of trained tactical trackers is among the most reliable and efficient resources a commander, officer or manager can apply in a search, including in advising and directing the search. Their specialty is to locate and find a subject, and they will.

We have also at the end added some information about natural navigation, survival and patrolling efficiency, including ways to optimize the use of active track traps through raking of roads, patrolling on foot in rugged terrain and minimizing weight and volume of patrols to increase speed and distances covered. Unfortunately, most people now associate modern, well-trained patrols with heavily (over-) equipped patrols with all kinds of advanced technology. This is not the solution in bush environments. We believe that this information can be useful to the park manager with limited resources available and faced with militias, guerillas or armed professional poachers moving fast and light.

This manual is intended to help improve the tactical skills of rangers and improve the ethics and enforcement skills. The poacher is the lowest part of the chain and often easily replaced. Killing of a poacher will reveal no valuable information, but merely escalate a conflict. The primary goal is to apprehend the poacher alive or follow him to his doorstep and through other means unravel the organized network. The probability of getting caught and sentenced is crucial in preventing crime, and tracking is crucial in this context in bush environments.

In the hope that the skills acquired here can be used for the good to protect wildlife, apprehend criminals and locate and re-unite the lost with their families and friends.

– Christian Nellemann, Senior Officer, Rapid Response, February 2011

1

COURSE IN TACTICAL TRACKING

The following presents a possible set-up of a three to seven day course in tactical tracking for rangers. There are many ways to do this, but all will require some of the very same elements. Emphasize students to understand the application and tactics and provide sufficient dirt-time to enable them to see at least basic sign.

TRACKING COURSE

Date: 3 to 7 days including night exercise

Gear: Field knife, measuring tape, flashlight, pen/paper, sign sheets, print card/notebooks (will be distributed). Bring food and water in field.

Objective: To increase the ability of the wildlife manager to track, train trackers, plan and use trackers in counter-poaching operations, and search for lost tourists. This includes the use of individuals and tracker teams in locating, tracking, interpreting and securing sign, and tracking and localizing suspects or wanted/lost subjects, including lost tourists, through the use of tracking. Furthermore, to increase the ability to advise park management in tactical search and tracking application in order to identify sector and delineate search area more efficiently.

The course is intended to:

- Enable the tracker/ranger to identify and see basic sign and follow sign lines using both step-by-step tracking and tactical sign cutting methods.
- Increase the ability of the tracker/ranger to relocate lost track during search including on “demanding” sites such as hard gravel, roads, and railroads or through water and contaminated areas, such as through villages and on trails.
- Increase the ability of the tracker/ranger to identify the right spoor/track in situations where site is contaminated or search has been delayed.

- Increase the ability of the tracker/ranger to exchange, leapfrog and deploy multiple tracking units/teams and increase patrolling efficiency.
- Increase the ability of the tracker/ranger to identify village and house/hut of poacher.
- Increase the ability of the tracker/ranger to define search sector.
- Increase the efficiency in the use of all available resources in search, including SAR, including sectorizing, delegating and delineating the search area at any given time based on informed decision making.

■ DAY 1-3

Theory (ca. 2 hours, board mainly)

- Programme
- History of tracking (LE, SAR, Combat, counter- poaching, hunting)
- Types of poaching – from local bushmeat to organized poaching
- Tools in counterpoaching
- SDP (Search and deployment patterns)
- Locating sign (type of sign, sign cutting, tracktraps, perimeter cutting)
- Time phases and perimeter cutting
- Reduction of time-distance
- Speed and distance for lost person categories
- Efficiency and search systems
- Procedures on site and at PLS/LKP
- Delineation and expansion of search area
- Actual cases (power point)

Exercises in field: Track pit and in vegetation STEP-BY-STEP

1. Trackpit

- Tracking stick, sun-angle, draw sign/print, walk next to spoor, marking and registering sign, print cards, characteristics of different modes of movement, head movement, running etc., step-by-step

2. Tracking and sign

- Grass, herbs: “pointers/flagging”, shine, dislocation, regularity, scrub marks, color, top, middle, ground sign, stain, nesting, no-sign-sign, cobwebs, dust, depression, disturbance, faeces, risers, bedding, shadow/light, sign below and in front, dry leaves, in creek/water, etc.
- Aging: Aging and age of sign (rain moisture, temperature, exposure, color change, change within a print/sign comparison techniques, etc.
- Brief intro only into interpretation of mindset and characteristics of subject from sign and signlines.

3. Exercises (grass, herbs, gravel, sand, road junctions, track traps, terrain, funnels, etc.)

4. Sign cutting

- How to approach crime scene and/or PLS/SKP
- Contamination and securing/preservation of sign at parking place, door, boat, house, tent, stairs, paths, resting sites, lost items, etc.
- How to walk by (“on”) the spoor
- Locating track traps, major and minor, primary and secondary
- Perimeter cutting
- Drawing of sign and partial prints, reporting, photographing sketch made

5. Tracking of each other 5m, 10m, 50m, 100m, 300m, no canine

6. Locating sign by road, creek, homegarden, house, hut, etc.

■ DAY 4

Theory: Lost track techniques and use of combined dog/tracking

1. Sign cutting and perimeter cutting

2. Re-locating tracks when encountering contamination or countertracking techniques, or “over-shoot” by “eager” staff on track

3. Route selection and time phases

4. Reconfirming sign

■ DAY 5-7

Theory and repetition of sign, contamination issues, track traps, cutting

Revisit sign 1, 2 and 4 days old and discuss aging on sign line and within individual tracks and on different ground.

Theory and briefing of scenarios, sign lines up to 1.5 km from LKP

Scenarios (select some):

1. Antelopes killed by most likely local bush-meat hunters, have abandoned broken-down truck under chase and run several hundred metres through stream to cast off trail and then through woodland.
2. Young western tourist couple disappeared 2 days ago from tent, possibly lost, track subjects step-by-step.
3. Located snares for antelopes, identify number, secure sign and direction of poachers.
4. Located traps set for endangered cats, track subject to and through village and hut.
5. Group of elephants killed yesterday night, subjects left area at a fast trot towards border, direction unknown. Investigate and secure crime scene and deploy teams to locate spoor and fast-track subjects.
6. Crime scene investigation.

Evening: Night-tracking

Debrief and evaluation sheets, brief introduction to requirements for attending advanced courses.

2

BASIC SEARCH AND DEPLOYMENT PATTERN (SDP) THEORY

The primary importance of this is to teach students the role of sector and time:

1. Time elapsed for defining search cordons
2. Distances possibly gained by suspect
3. Importance of identifying a primary search to optimize use of limited resources
4. To understand that no-one moves randomly
5. Perimeter cutting

This is supported by two tables:

- Subject speed characteristics in different terrain and conditions; and
- Lost person behavior, especially valuable to the SAR team.

During training students will be taught methods to predict routes, to effectively cut for sign, to confirm, and to leapfrog tracker units further out in search to intercept suspects on the move away from crime scene.

This manual will not contain details of advanced evasion and counter-tracking techniques. While most counter-tracking techniques have limited value against a professional tracker team, evasion techniques are something entirely different. There are combinations of time phases and evasion techniques that are more effective than others. For the fear that such information should reach the wrong audience, they are not included here. Again, students attending advanced courses will learn these.

The search for a wanted suspect or missing person always theoretically starts with estimating:

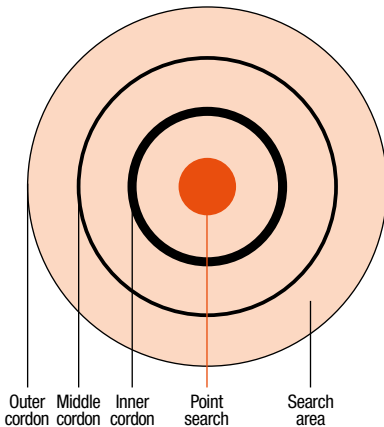
1. Time elapsed
2. Estimated speed of subject

Time and speed will define theoretical search area by:

Search area = $3,14 \times \text{radius}^2$; where radius = time x speed

3. The search team will then establish point search, inner, middle and outer cordons.
4. Deploy trackers on-site to determine prioritized sector and secure sign and prints positively related to suspects.

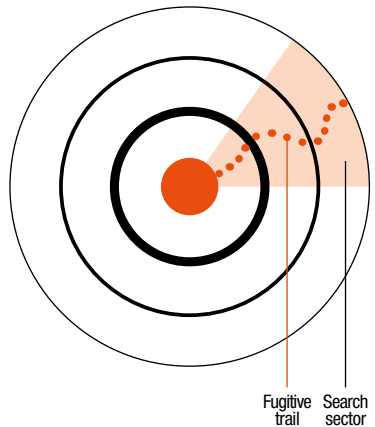
Fugitive runs 2.5 km/h, 4 hours elapsed, radius 10 km



Situation A

Direction unknown

400 men searching $3,14 \times 10^2 =$
 314 km^2 or 1 man/ km^2



Situation B

General direction determined

400 men searching a sector of ca 1/8th the size or 39 km^2 – or ca 10 men/ km^2 – or “the work of 350 men done in an instant”

Rule of thumb:

- For each 1 km the fugitive moves he/she nearly doubles the search area.
- At normal speeds a suspect on foot doubles search area every 15 min (at least every hour).
- Identifying general search sector (i.e. North-East/NE sector) by tracker and or K9 reduces search area, time and needed search personnel by factor of 4.

Subject speed characteristics in different terrain and vegetation

The numbers are used to define search cordons and time frames for perimeter cutting. Speed is in addition estimated by length of stride, sign and spoor and quarry characteristics.

Vegetation and terrain	Foot running (km/h)	Light gear (km/h)	Heavily loaded (km/h)	Night, difficult, no load (km/h)
Open trail, flat terrain	8–12	4–6	2–3	2–3
Open trail, rugged terrain	6–9	3–4	1–2	2
Through bush or forest, flat terrain	5	3	2	1–2
Through bush or forest, rugged terrain	4–5	2	1–2	1
Jungle, easy, flat terrain	2–3	1–2	0.3–0.5	0.3–0.5
Jungle, rugged terrain	1–2	0.5–1	0.1–0.3	0.1–0.3
Jungle, dense, rugged terrain w/swamps	<1	0.1–0.5	0.1	0.1

A traditional western SOF will haul 40-80 kgs or more during operations, a guerilla frequently <10 kg incl. weapon and use caches. (C. Nellemann)

A kayak will move at 4–7 km/h, a canoe 3–4 km/h. A bicycle 15–35 km/hour, a small motorcycle on poor roads 25–45 km/hour, 40–70 km/hour on better roads. Vehicles move typically 75 km/hour on good roads, 40–50 km/hour on poor roads, assuming no traffic.

Expand search perimeter every 15–60 min. Remember the fugitive doubles search area for every km he/she moves from PLS (place last seen) if direction is unknown.

Lost person behavior – distances from place last seen (PLS)

(Compiled from Ken Hill, Nova Scotia; SARstatistics.com, Twardy et al., 2008; Torkildsen, 2008 and Nellemann, unpublished) (n=967 cases)

Category of missing person	No. of cases (n)	Median (km) (half walked farther than)	50% zone (km) (half were found within)	Australian data (km) median (n) (Twardy et al., 2006)	Norwegian data (km) median (n) (Torkildsen, 2008)	Proposed Search (km) range cordons (inner cordon)
Child 1–3	35	0.5	0.5–2	3 (34)	1.7 (30)	0–3 (0–1)
Child 4–6	25	1.6	0.9–2.5			0–3.5 (0–1.5)
Child 7–12	30	1.8	1–2.5			0–7.3 (0–2)
Youth 13–17	36	3.7	1–3	–	–	0–18 (0–4)
Walk-a-ways	65	4	0.5–1	–	1 (19)	0–10 (0–2)
Despondents	54	1.5	0.5–20	1.5 (23)	2.4 (74)	0–12 (0–2)
Fishers	41	1.4	1.0–4	–	1.8 (94)	0–18 (0–2)
Hikers	39	2.2	1.5–4	3.2 (72)		0–24 (0–3)
Hunters	124	2.4	1.5–4	–		0–20 (0–3)
Other	116	1.4	–	–	1.9 (50)	0–16 (0–2)
Ranges		0.4–4	0.5–4	–	–	0–24 (0–4)

Note that there are instances where individuals have walked beyond these ranges. The distances are for people on foot. It is essential to establish an approximate profile of person and modify search cordons accordingly. Beware of under-estimating outer cordon distance.

- Point search within local proximity (100% cut-off)
- Inner cordon (95% search intensity, sector preferred)
- Middle cordon (50% search intensity, sector necessary)
- Outer cordon (maximum distance investigated, full range, sector crucial)
- Establishing sector is vital.

3

TRACKING TRAINING

We strongly recommend that courses are run by professional, experienced trackers with experience also from law enforcement. You will generally need a track pit, an area where there is sand or similar that can be raked for initial basic training, a surrounding area for exercises and smaller trails including a variety of undisturbed vegetation. Ensure that tracking conditions are very, very easy, but include short stretches, from 1–5 m to 20–30 m of difficult ground for in-depth training. If a creek and road junction/village is also available it is good to include section with sign lines through inhabited areas or junctions and through water/dry hard ground. We have included some photos from actual training to help illustrate this. Be advised that you should not apply equal amounts of time to all topics in the first course. Your primary objective is to teach students the basic techniques and principles in tracking for identifying and seeing sign, and the tactical setting in which it is applied. Start very easy to build confidence and interest.

Light angles strongly influence your ability to observe any sign. Always look at a sign with the light coming from an angle towards you. Hence, the shallow, shallow shade created by the micro-structure in the sign will enable you to observe the outline of the sign or print, whilst looking with the sun in your back will allow you to see next to nothing.

Firstly, let students notice a simple shallow set of prints by looking at them with the sun in their back. Let them walk around and get the “magic” experience of suddenly being able to see the same sign so clearly facing the sun.

Secondly, teach students the immense importance of always walking on the side of a sign to avoid contamination. Use the track pit to let them work in easy conditions with a subject running or walking. Let others contaminate the pit and let them experience the importance of light, the tracking stick and of avoiding contamination.

Sun angle is EXTREMELY important for observing a sign – sometimes you even want to use a flashlight for help. You should ALWAYS look towards the sun with the sign between you and the sun. The four illustrations show a print easily visible in the bottom photos, when looking towards the sun, and barely visible in the top photos, when the sun is on your back. In equatorial regions, tracking is best in morning and evening when the sun angle is low, while heavily overcast weather and “flat light” can sometimes make it harder.









4

THE TRACKING STICK AND SOLE PATTERNS

The tracking stick can be any stick located and cut to help mark foot and stride length. It can be a designated stick/pole, a measuring tape or ruler, your forearm or a firearm (“long”). When you have measured the stride length, the value can easily be used to determine the small limited area upon which the next minuscule sign may be located as part of the pace. If you do not locate the next sign, cut around in loops as described for lost track techniques using track traps, or very carefully scrutinize the last impression to note change in direction, jump or similar. Remember also that stride length varies with pace, but also increases downhill and shortens uphill, as well as with heavy weight or exhaustion. Mark whether it is a right or left foot by drawing a simple line on the outside of the heel to the right or to the left. This can also help you together with stride length to find the next sign.

We highly recommend accurate measurements of the length of the sole from several prints/depression/sign, even if the sole as such is not visible but merely a depression of vegetation. It is surprising how accurately you can measure sole length even in vegetation. These measurements quickly become invaluable wherever, and there most often is, risk of contamination and where sole patterns are rarely observed, or sole patterns are very common. Remember to clearly mark any wear in sole pattern. Make a hand drawing in addition to your photograph if camera is available, where specific sole and heel characteristics are clearly measured and marked – BE PRECISE. Stride length is not only helpful in locating the next sign – it is also an information source. Also note foot angle. Remember that you may have to combine several partial prints to get a “complete” sole. You rarely get a full print on a silver platter.



Remember to record how you measure stride length:

1. From heel to heel, from toe to heel or from heel to heel or toe to toe. Sometimes when backtracking you may find that measuring from heel to heel or if subjects are running uphill from toe to toe is easier – at other times, from toe to next heel is easier. Make sure you mark clearly which measurement you are taking. Certain situations can make either advantageous – IMPROVISE! But make a clear note on what you use.
2. Measure stride length in several locations.
3. Combine several partial prints to put together a “complete” or partial sole pattern. Remember also that the print is “mirrored” from the sole if located, and which is right and which is left.
4. Photograph and draw unique patterns on your notebook or print cards, and make a ring around or stick at especially valuable sign/prints on the ground so that colleagues or yourself do not step on and destroy evidence.



Measuring from toe to heel – recommended.



Measuring from toe to toe – good where mainly toe marks are visible.



Measuring from heel to heel – good where mainly heel marks are visible.



Basic training in track pit learning basics of sun angle and measurements



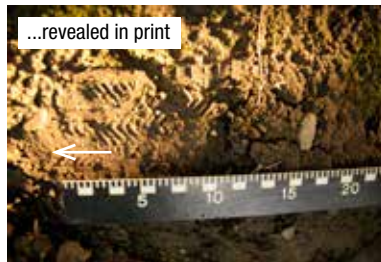
When using tracking stick it is normally easiest to measure from toe to heel so that next sign, often a heel mark, should be right in front of point of stick. Sometimes, however, if looking for toe sign or other signs you may want to do differently. In this case, the officer has marked for illustrative purposes only the area in which the next sign (shown by big print) should be.



Measuring from heel to heel here was necessary to find the heel mark in photo to the right.



Look for and make as detailed drawings and photos of prints. You may have to combine several like a puzzle. In this case it was even possible to see on 5-day old prints below the wear in the heel of the shoe (pronation) and make a direct match with the suspect later, who was convicted of a serious crime and sentenced to several years imprisonment. Notice "mirroring" of sole in print.





Estimating the number of persons, especially if wearing similar footwear and running in file formations, is best done when your suspects are:

1. Spread out
2. Taking breaks or sitting down
3. At camp or when consulting each other
4. At top or bottom of hills, where suspects often stop

Some recommend counting the number of prints within one or two stride lengths and dividing by two, but rarely do you have such good track traps and the method is inaccurate. It is far better to simply look for where they spread out and count number of individuals – even if only signs and not prints are visible.





Tracking class of rangers in East-Africa, author standing to the rear



A female tracking team with instructor after completion of tracking course. Two of the female students became the best out of 60 men and women in this particular course.

A ranger demonstrating the use of the firearm as a tracking stick to measure stride length. In cases of armed hostile fugitives, a second ranger (cover man) will always be physically next to the tracker, normally no more than 1 m behind to the left or right so that he/she will cover the tracker as the tracker will be watching the sign and not fully observant of risks ahead. Notice light gear.



5

TRACKING PROCEDURES WITH AND WITHOUT K9

This chapter provides a simple overview of basic procedures in commencing tracking near a crime scene of last known position (LKP). It also provides a brief overview of lost-track procedures. Once again, it is critical that you NEVER walk on and destroy the sign, but walk on the side of the sign line. Make sure that you mark every critical partial print or sign at intervals, so that you have confirmed sign to return to when you lose the sign line. While you should never move beyond the last visual sign, sometimes speed required and the use of track traps to overcome the time-distance gap may cause you to lose the sign. Remember to confirm the sign line as often as possible, and in the case of lost children or similar – never lose it, but take the time needed.

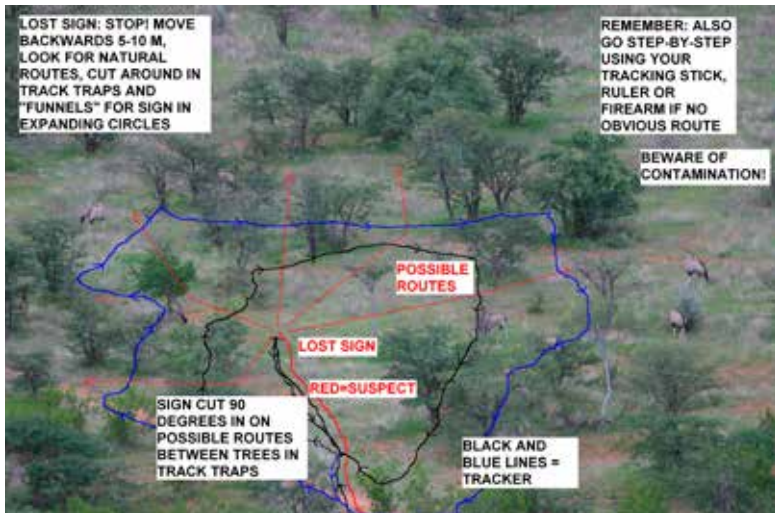
Tracking procedures

1. Secure area and main natural routes of evasion/travel for sign protection.
2. If K9, hold back K9 and cut for sign FIRST in primary or secondary track traps such as by outlet of vehicle door, building, Place Last Seen (PLS), road sides, trail entries, and steep up or downhill sections of trail/terrain to secure whole or partial print positively related to suspect.
3. Mark and secure sign. If urgent, simply mark and make mental note. If SAR or criminal investigation, make a sketch (you can return to this also afterwards but make sure sign is preserved).
4. Identify sector.

5. Other intel supported also by interviews if possible:
 - Subject characteristics
 - Subject mindset and physical condition
 - Weather
6. Deploy dog or tracker on spoor, walk on side.
7. If site is contaminated or too old, either go step by step if possible or cut for sign BY TRACK TRAPS prioritizing likely route of evasion and put dog on most likely sign further out. REMEMBER STILL TO SECURE AND MARK PARTIAL PRINTS at any time encountered!
8. Hold back K9 in front of any track trap, confirm track and go step-by-step.
9. Send out K9 units/trackers in likely route of evasion and cut for sign by primary track traps, such as wetlands, mud banks, river drainages, sandy parts, rich vegetation, ditches, entries to trails, etc. near last known location to cut for exits.
10. Cut in track traps to CONTAIN area, establish perimeter and eliminate sectors.
11. Cut in track traps to contain area and determine search sector.
12. CONFIRM sector and direction at 1–2 km – contain area/”closing the gate”.
13. Leap-frog teams for perimeter cutting or cut-off.
14. Re-confirm sector and directions at points further out, check for track traps in funnelling terrain and track traps at greater distances.

Lost track techniques

1. If track is lost – STOP!
2. Move back 5–30 m to last known certain track and look for likely route of evasion.
3. Cut around specifically targeting track traps – and look for confirmatory sign.



4. Circle around and look for track traps in funnelling terrain, moving as perpendicular on track as possible and stepping only where you will clearly see any imprint/sign that you make, if possible.
5. Confirm fresh sign or print.
6. Assign spoor again to dog along with encouragement.
7. If track is lost along road, trafficated area, in water or in dry vegetation, cut along sides or in track traps until you find the exit.
8. Re-confirm track and spoor and continue.
9. If unsuccessful, go back to last positive sign/print/track (marked!) and re-try. If necessary go step-by-step.
10. Re-deploy dog/tracker on new route.

Appendix tracking procedures

1. Identify correct direction and sector.
2. Identify speed.
3. Estimate age of sign.
4. Other intel supported also by interviews if possible:
 - Print characteristics
 - Arms
 - Activity
 - Subject number, mindset and physical condition
 - Estimate speed and distance and search area
5. CONFIRM sector and direction at 1–2 km – contain area/”closing the gate”.
6. Leapfrog teams for perimeter cutting or cut-off.
7. Tracking rules: “orsu vincit” – “He who has the initiative, wins”. The only difference between the hunter and the fugitive is the initiative.
8. Never walk on or go beyond sign, but go on the side.
9. Never cross dead zones, such as open terrain, unless absolutely necessary, but circle around for track traps and pick up track again.
10. Make sure you have flank security and cover man; use Y-formation or semi-Y formations.
11. If risk of snipers circulate potential positions where you may be fired upon, at 70–300 m or where you will be exposed, and check for tracks into possible position by track traps from opposite sides.
12. Move stealthily as if your arms were unloaded and use lead scouts.
13. Only run when trying to cut off or reach perimeter points, never on spoor due to risk of ambush.
14. Always look for natural travelling routes, funnelling terrain and rugged terrain where the fugitive may hide – foxhole exits.

6

CRIME SCENE AND CONTAMINATION

The greatest problem and challenge in tracking is not weathering or lack of sign, but destruction of evidence, sign or even excellent prints by bystanders, the curious, relatives, staff and colleagues, and most of all – yourself.

1. If you approach by vehicle, park several hundred metres – at least 100 m – and do not start turning around but simply stop, so that you do not destroy sign leaving away from crime scene.
2. Remember that the “inner” crime scene will not disappear quickly, but the sign, prints and evidence OUTSIDE the inner crime scene or area fenced off quickly will! They may easily turn out to be critical. Often sign lines will lead you to first best sole pattern outside inner crime scene. Your car will have erased prints in the only available track trap nearby!
3. Establish one single entry and exit where you clearly will see if any sign has been made. Often people make the mistake of putting out an entry where they feel it's hard to see sign, in the middle of a natural route – thus obliterating the only minuscule sign present!
4. Pull out tape or drag a stick so that you and colleagues only walk into crime scene in ONE route and do not start trampling around.
5. Visit the crime scene also at the time of day the situation took place – for example, at night – as this will help you understand what happened.
6. Keep crime scene fenced off for a long while. You will often realize that you will have to come back to look for additional evidence after you thought you “finished” the search.



Crime Scene Investigation: Improve! In lack of better, yellow post-it notes and tooth picks were used.

In crime scenes your level of detail in tracking should intensify – what exactly happened? By analyzing every single print/sign and their order, you can tell the story more accurately, including looking at pressure points and twists inside the prints to determine action, direction or even head and body movements.

Special note on camp sites:

In many instances the poachers may already have left both the crime scene and the park, making sure they have high speed – and sometimes takes steps to minimize sign.

1. Follow back trails, where suspects are less likely to protect their sign to locate vehicles or camp sites.
2. This is particularly true with regard to camp sites or lay-up points.
3. In many cases these are not organized poacher camps, but merely signs of someone lying under a tree with or without remnants of a small fire. However, they can be a treasureland of information.
4. The type of fire made can be special, as fire traditions vary greatly, including wood selected and construction of fire, or even characteristic of one particular person's personal preferences. Examine if the firewood been cut or broken, or if trash has been burnt. Check temperature of coals by poking. Many cultures do not burn garbage in the fires.
5. Food spilled also provides information. The type of rice or corn flour can be very specific to different tribes or locations – not to mention rations buried or left behind. If no food or fire is made at sleeping site or if defecation site present (absent), it is a sign of tactical training and high alertness. If they used stoves rather than fires or were on hard routine (cold food), or even carry their urine or faeces with them, it is also a sign of a type of patrol and their training.
6. Tactical placement of lay-up points or camps will reveal their level of alertness and training.
7. The camp site will also provide you with number of persons involved, as well as information if a sentry was present or not, or whether they had arms (rifle butt marks near trees!). You may also count the number of people by examining butt

Tracker inspecting the type of fire and food remains in a poachers camp, East Africa – type of fire vary from tribe to tribe.



Poachers camp



marks around bed sites, in areas from where they fan out during the trail, around fire or at resting sites. Indeed, camp sites are great for locating multiple tracks and sole prints.

8. Defecation and urine: You may also determine from defecation “bathroom” sites what they have been eating and time the area was abandoned. Faeces will quickly get a harder dry shell, dependent upon climate, and acute smell goes down after 1–2 days – smells if poked and the “shell” broken. Degree of insects varies with location and time of year, generally most the first 1–3 days, but some lay eggs also. Furthermore, determine if they used toilet paper or dried themselves with vegetation or with small rocks. Examine if they dried themselves with right or left hand (typically left hand in many cultures where the right hand is used for eating, right hand used for wiping in western and many city cultures). You can sometimes also see marks from or smell urine. Sitting position for urinating combined with toiletpaper or grass thrown to one side ahead of subject and not behind suggest woman urinating.
9. Spills: Cigarette butts, spilled ammo, tea bags, tobacco, or buried cloth from menstruating women may be present in camp. And much more. Except for minor food spilled, it is rare to find a lot of lost items, but you will find plenty of good tracks and sole prints, particularly near water and washing sites, inside or in front of bivouacs or tents (tourists).
10. Transport: Determine if they have used horses, donkeys or mules or a combination, not to mention vehicles or marks from radios on the ground. You may identify characteristic hoof marks and the belonging suspect’s sole marks where mounting or dismounting horses occurred. Some cultures do not use pack horses but carry gear all on their own animal, while others do.

Poacher camp located during patrol. Camp included several sign and evidence: 1) Sign of two persons lying; 2) Stick with white local corn flour; 3) Sharp stick used for climbing inside hollow baobab trees for caching; 4) Strip of tire for repairing sandals; 5) Defecation "toilet" site nearby where suspects had dried themselves using left hand suggesting locals (Europeans most often use right hand). All in all pointing to locals.





Cooking stick stuck inside branches provide valuable information on cooking habits, food obtained and origin of poachers.




Remnants of a meal can provide valuable information on origin of poachers or supply lines. Here, white corn flour distributed locally suggest local – in another case yellow corn flour was found. Yellow corn flour was only distributed in Burundian and Rwandan refugee camps across the border. Type of rice in Asia, for example, can vary greatly among villages and regions, hence, a few grains of rice spilled near a cooking fire can provide valuable information to the tracker.

Types of fires and presence or absence of trash are also valuable sources of information to the tracker. Many types of fires for cooking vary among tribes, regions and cultures. In Tanzania, for example, at least five types of fires can easily be distinguished, including cooking on parallel logs, cooking on 3 stones or cooking on three sticks pointing together. Ask, visit and learn from locals also outside your immediate region how people build fires, types of wood used, and whether or not they burn trash in fires.

Avoiding contamination – Locating primary sign

 Direction and movement of poacher and animal –
DO NOT CONTAMINATE THEIR SIGN

 Direction and movement of ranger – on the side or
perpendicular to crime scene AVOIDING contamination!



Prime sign area



Track trap – check for sign



Beware of sign crossing fire-breaks, roads or dried out river beds – can sometimes be observed from vehicle or helicopter or fix-wing – land/park at a distance!

Backtrack to camps and infil routes – more sign and evidence as subjects less cautious!



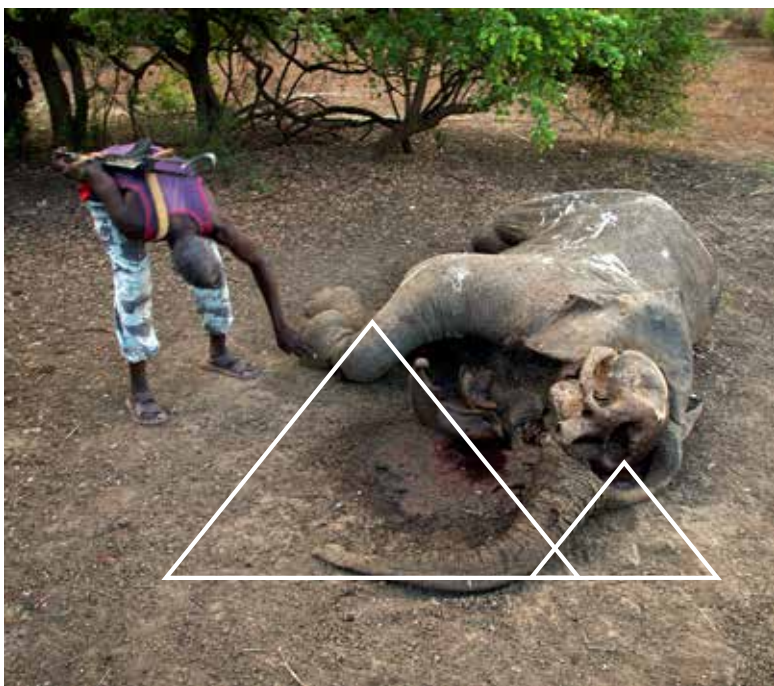


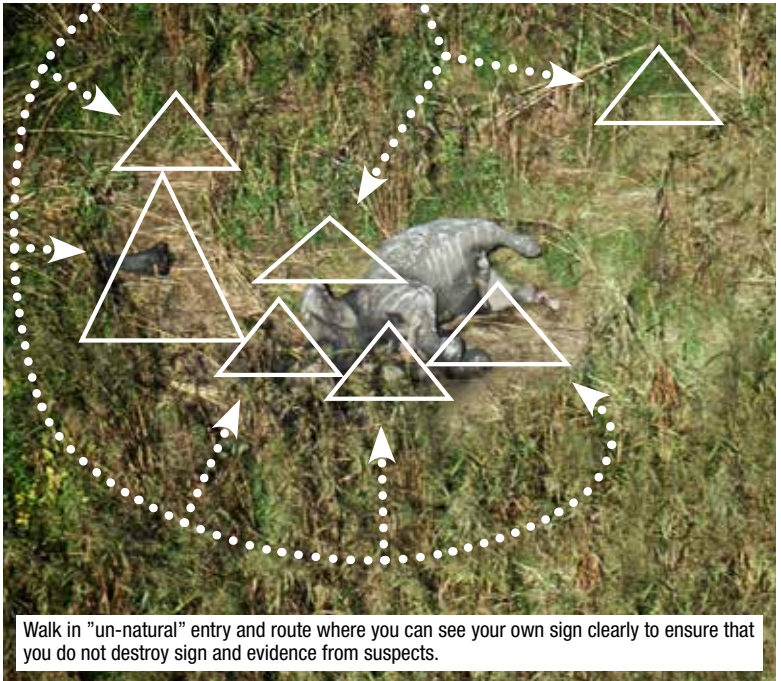
Traps/snares and sign typically placed on trails in "funnels"

Establish no-cross line for recording and securing sign – see tape.



Find in- and exfil routes. Establish exfil route and direction for sector search.





Rangers have parked their horses away from crime scene and are circling to locate tracks of poachers.





Avoiding contamination of crime scene



Restrict access to crime scene by ALL staff and tourists – allow ONLY one ENTRY-EXIT.

SECURE AREA OF AT LEAST 100 M RADIUS. Do not allow staff/tourists to surround it!

Staff is greatest contaminator of sign!

Vehicles are the second greatest destroyer of sign and tracks. PARK AT LEAST 100 M AWAY. Do not turn vehicles or drive around, but simply STOP!

Be CAREFUL where you park. Do not destroy criminal vehicle tracks or prints or sign!

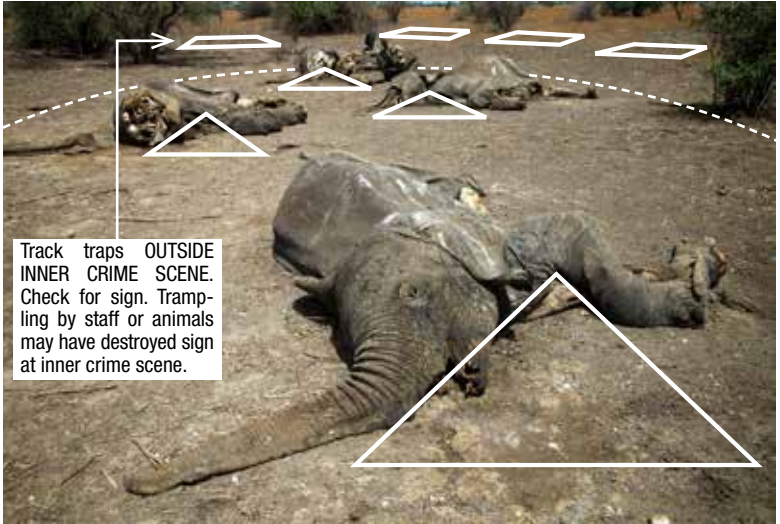
(In this photo the ranger had secured evidence first then moved in truck to turn over elephant to look for bullet wound.)



BEWARE THAT CURIOUS TOURISTS, SCIENTISTS OR INTERNS MAY DESTROY CRIME SCENE, EVIDENCE AND TRACKS!

It will merely require you to cut for sign in larger and larger areas = loss of time and evidence.





Track traps OUTSIDE
INNER CRIME SCENE.
Check for sign. Tramp-
ling by staff or animals
may have destroyed sign
at inner crime scene.

Cut in track traps in funnels outside immediate crime scene. Secure entire area to avoid contamination! Restrain movement, park far away, and only send in trackers! Walk in "un-natural" entry and route where you can see your own sign clearly ! Establish route for staff, drag stick in dirt and make line to follow!

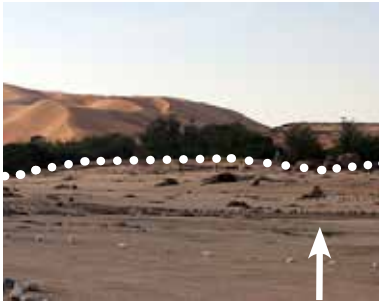


Check for sign in the expected shadow at time of crime and where vehicle was parked – at doors, side and back – and count number involved.

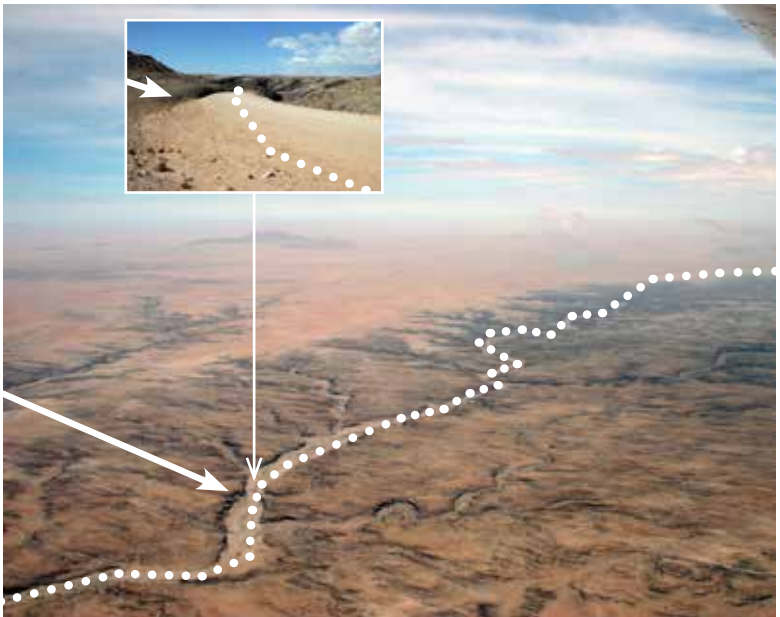


Check for sign in natural observation posts on kopjes, wood lots, cover, "where you would have selected a spotting/observation post for the crime scene" – more sign and trampling.

Sign cutting



Cut along roads, trails, and natural track traps or follow natural lines in landscape. If track trap do not cut along places where it is extremely hard to see signs, you may miss them!







Be observant of eagles, vultures or other birdlife that may signal carcasses or movements of people.



Baboons may signal human presence.



Sign cutting and crime scene



Carefully cut along all track traps, such as river beds or roads also for detecting illegal intruders into parks.



Sign cutting along "raked" road from horse (mule) back: By raking roads using a towed rake or log behind vehicles you create track traps for perimeter cutting.



7

SECURING EVIDENCE AT CRIME SCENES

Forensic science is largely based on Locard's Exchange Principle: "Every contact leaves a trace". In other words, anything that your suspect has come into contact with may hold valuable evidence linking him to a place, person, animal, or object – and vice versa.

Some examples of where forensic evidence can be found are:

1. **Clothing:** The suspect's clothes can hold forensic samples such as blood, hair and firearms residue. The suspect's shoes can include soil, which is specific to the areas they have trodden and may be matched to shoemarks at crime scenes. Think about seizing the clothing being worn by suspects, along with any items discarded at the scene. Tip: Wet clothing can rot quickly. Try to dry clothing before storing it, but take care not to shake off any debris.
2. **Tools and weapons:** Poachers will use a variety of equipment in their activities. Firearms are often used, so seize any weapons bearing in mind some are home-made, along with spent cases or cartridges. **REMEMBER – FIREARMS AND AMMUNITION SHOULD ONLY BE HANDLED BY OFFICERS FAMILIAR WITH THEIR USE.** Knives, carving instruments and other tools may hold fluids or debris linking them to other evidence, and tools can often be linked to the marks on carvings. Snares are often used in poaching of wildlife, so any wire should be seized in case it matches other samples. Cutting implements can be linked to the cut edge of snare wire. Tip: Even small off-cuts of wire, or carved bone, horn or ivory may contain valuable markings.
3. **Carcasses and animal parts:** Animal remains may still contain spent bullets lodged inside the tissue. It may be possible to link these to any firearms seized. Tip: When you remove bullets, try not to use metal tools as these can scrape the soft lead and obscure marks made by the firearm. The tissue and hair of animals may also be linked to fluid and debris found on the suspects clothing or weapons.



4. **Electronic devices:** Cellphones and SIM cards, GPS devices, compasses, laptops, cameras and even iPods can contain important evidence such as contact details, locations, diaries and photographs. These devices can prove invaluable in identifying associates of your suspects and identifying buyers and sellers. **Tip:** Try not to let officers interfere with these devices. Take them back to your base and have them carefully examined by experts.
5. **Paperwork:** Receipts, bills, address books, maps, notebooks and random scraps of paper can often reveal useful evidence such as contact details, prices of commodities, and travel plans. **Tip:** Don't forget to search rubbish and campfires for papers that have been discarded.

Contamination

Contamination occurs when forensic material (debris, fluid, etc) from one item is transferred to another item by incorrect or careless handling and storage by officers. Microscopic samples can be transferred very easily so every care should be taken to avoid contamination. Different officers should search, seize, package and seal each item. Officers who have searched or arrested suspects should not go near to a separate crime scene and vice versa.

Securing evidence



After initial approach to crime scene to secure sign, let either experts secure evidence, or if not possible, use gloves or spoon to secure dirt samples, extract bullets, locate spent cases and secure in clean paper bags/folded paper/envelope – NOT plastic bags.

Mark and photograph all sign. If you do not have stickers, simply cut and rip bark of twigs and stick them next to sign that you photograph and draw up crime scene with entry and exits of suspects. IMPROVISE!





©Interpol



©Interpol

Origin of guns (HK G3 and an AK47 behind), fingerprints, dust residues, DNA or dust from horns, may become evidence. Do not contaminate!



Soil samples

©Interpol



©Interpol



©Interpol

Collection and storage

Forensic samples should be collected carefully to avoid the risk of contamination or damage to the sample. Different officers should search and seize different articles. Use clean tools or even broken branches to seize each item.

Package each sample separately. Wet samples can rot easily and should be dried and/or frozen as soon as possible. Paper packaging will prevent items from rotting but can be contaminated. Plastic is great for preserving DNA samples but clothing will 'sweat' in plastic. Use the most appropriate packaging you have available. Consider making up a 'Forensic Search Kit', which contains all the items you might need in a search. REMEMBER to ask for advice from experienced officers or forensic support staff.

If you do not have DNA kits with gloves available, simply fold a sheet of paper or use an envelope – not plastic bags – and gather with a clean spoon or knife tip small soil samples (the size of your little finger) from surface soil/dust. For DNA samples of wildlife tissue for tracking the origin of a confiscated rhino horn or ivory, for example, cover your mouth with a cloth/shirt, cut away a piece of the hide/skin and put in an envelope of paper or piece of folded paper – NOT plastic as sample will rot. Do not touch with your bare hands but cut off with preferably clean knife and use a small clean stick to put in sample bag/envelope. If the crime is serious and you have belongings left by suspect such as drinking bottle, hand tool or firearm, these can contain both fingerprints and DNA.

If DNA kit is available, follow instruction on kit. In general:

1. Secure at least 3 different biological samples at crime scene for analysis.
2. Note, photograph and measure sign where sample is taken.
3. Avoid contamination (use mouth cover, gloves (or hand inside clean plastic bag) and avoid touching sample.
4. Dry samples gathered on knife tip or wet cotton stick from firstaid kit/DNA kit with one drop of pure water, rub against sample and put stick in envelope. Follow the same procedure for wet sample without adding drop of water. Secure any original sample such as cigarette butt, chewing gum or headwear from suspect in paperbag.
5. Collect samples from all staff that have been on crime scene and make a note on this.
6. Provide full crime scene description with tags on all items described, take photographs, make drawings and mark with numbers as you may not recall the information later..

8

TRACK TRAPS AND SIGN

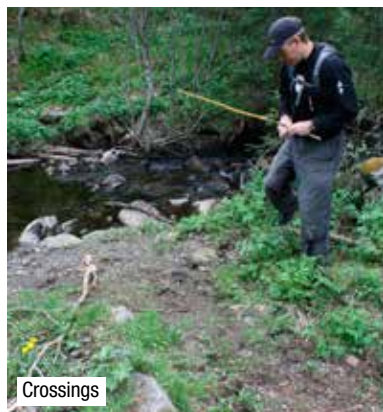
Track traps are simply any type of soil, vegetation or surface where you have to leave sign if you cross. These can be man-made or natural, or even maintained, such as raking of gravel roads to check for crossings. These provide some of your most valuable assets in tracking, both for cutting for sign, perimeter cutting and for lost-track procedures.

You may also actively maintain track traps by raking roads, river beds or similar, and by avoiding patrolling or travelling across natural track traps such as river banks, dry river beds (wadi's), long stretches of tall grass or herbs, etc.

For the crucial description of an individual sign, see the photos. Be advised that seeing and understanding sign is what tracking is all about, and it can **ONLY** be learnt through substantial dirt time – training and practice.



Primary (major) track traps





Stream banks



Water holes



Forbs



Grass



Ditches/dusty roads



Ditches/dusty roads



Fields



Sand dunes, road cuts



Man-made barriers

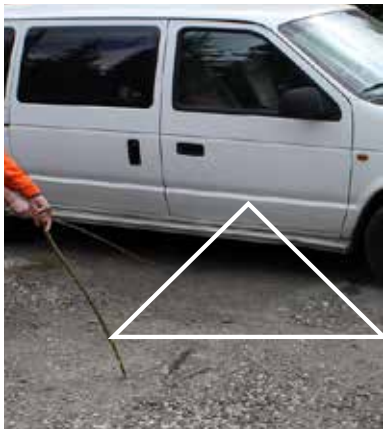


Mud/banks

Secondary (minor) track traps and prime sign areas



Funnel between river and snow



Prime sign area at doors, gates, entry points.

Sign (ground and top sign)



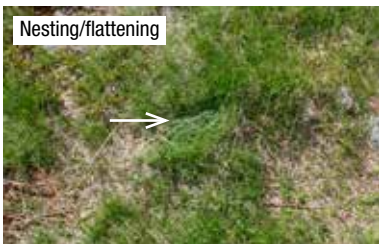
“Risers”



Nesting/flattening



Nesting/flattening



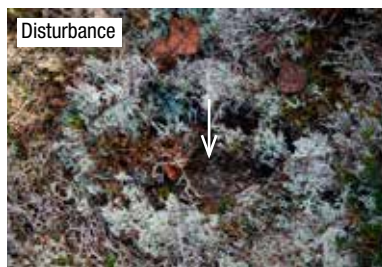
“Horseshoe” uphill

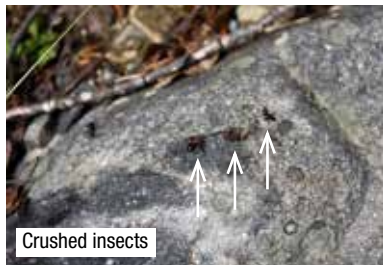


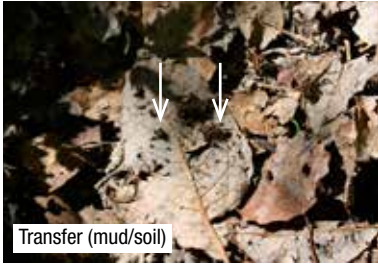
“Horseshoe” uphill





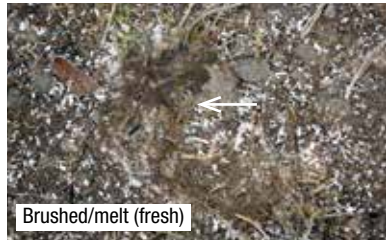


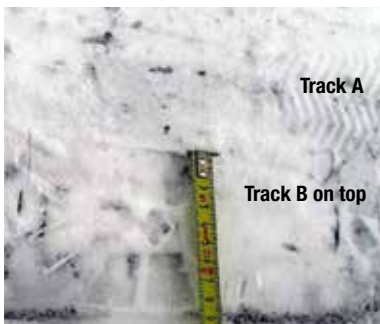




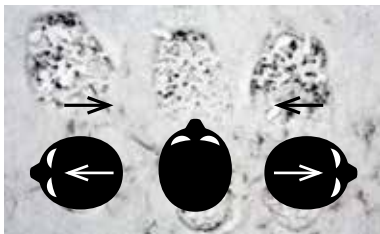
Sign and track traps in frost







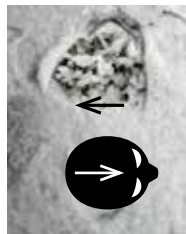
Head movement and opposite front sole twist



Head turned to the left = toe twisted to the right
 Head turned to the right = toe twisted to the left

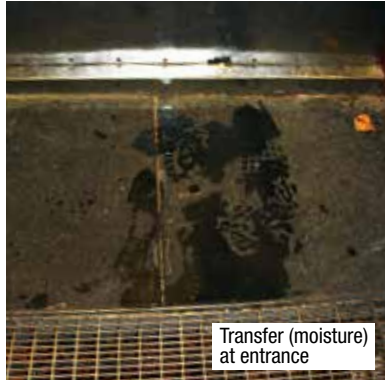


Straight forward



Lower toe twisted to the left

Step mounds: Older prints and snow “hummocks” generate surface irregularities for capturing new sign on top.

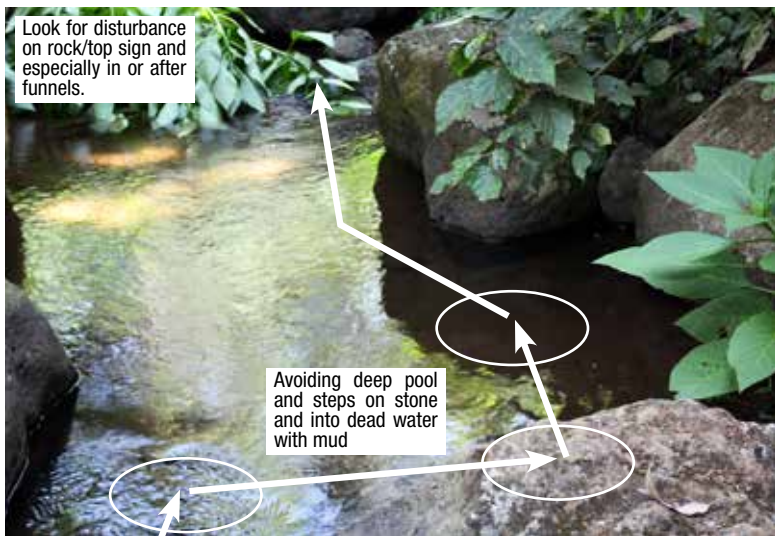
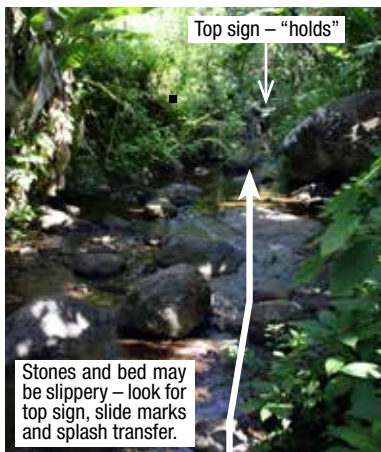


Transfer (moisture)
at entrance

Brushed, risers and
color change



Tracking in water



“Eddies” and still-standing/
dead water outside current
will preserve sign longer.



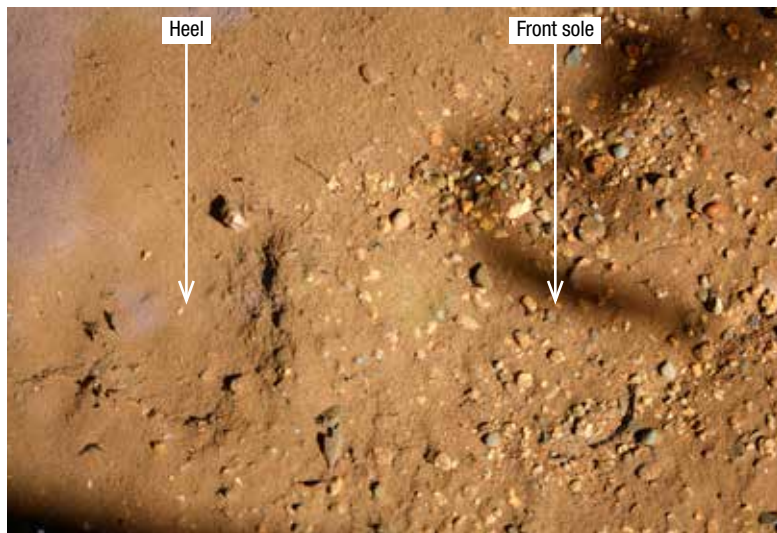
“Mud cloud”, mud dissolved
in water after immediate distur-
bance, may last seconds
to up to a quarter.

“Mud cloud” dispersing leaving exposed gravel amidst mud



Dispersed mud has left exposed coarser pebbles and gravel giving a rough outline of sole and heel.

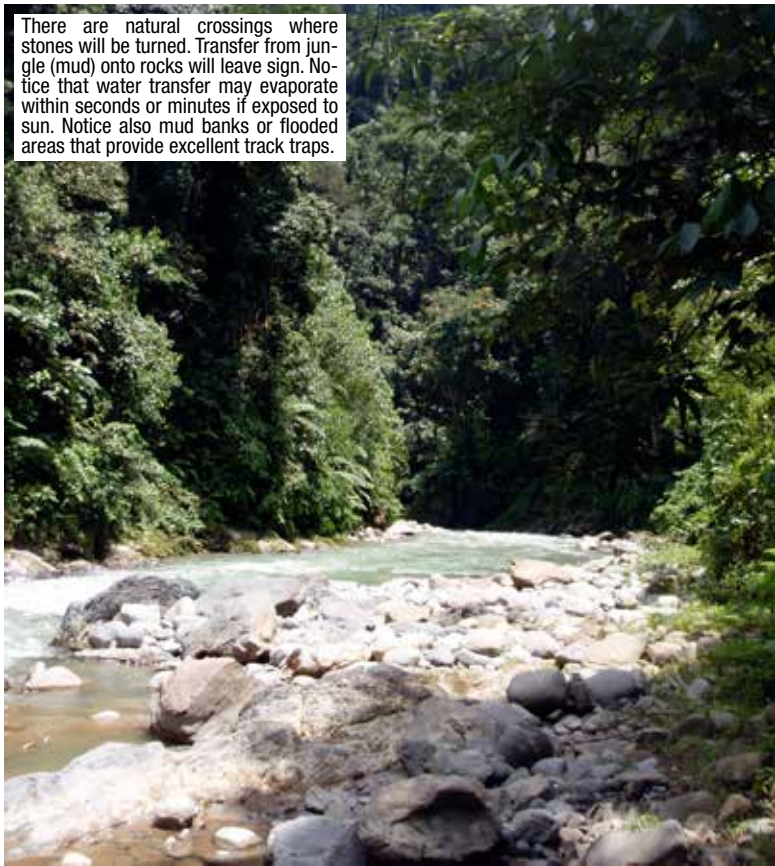








There are natural crossings where stones will be turned. Transfer from jungle (mud) onto rocks will leave sign. Notice that water transfer may evaporate within seconds or minutes if exposed to sun. Notice also mud banks or flooded areas that provide excellent track traps.



Moving down steep slopes and banks towards drainages will often leave very heavy slide marks.



Disturbance



Color change



9

AGING OF SIGN

Aging of sign is a large and complex field that requires substantial training. Following are a few major guidelines (see photos for further info). Place your own footprint next to the sign to compare.

1. What has the weather been since time of passing? (Sometimes knowledge of weather can also inform you about the age of tracks.) You are basically looking for degree of decay or erosion so exposure, type of substrate and weather will dictate decay.
2. Never determine age from one sign alone but compare the sign line including different sign and/or prints with varying exposure and texture to estimate age.
3. Different vegetation decay differently, based on exposure and type of vegetation. Sun and drought resistant vegetation decay or dehydrate much slower when broken than thin-skinned lush riverbed vegetation.
4. Transfer provides a good opportunity as water splashes, mud or transfer of dust will dry out faster than natural settled substrates as it is per definition out of place. Washing off of smaller soil or dust particles on leaves on the ground can tell you time since last rain.
5. Water drops on under side or upper side of bent vegetation will tell you time of passing if there has been dew or rain. Bent, pointing or standing vegetation will still be dry on underside of leaves if crime occurred recently after rain/dew. If crime occurred before rain it will be wet on both sides as vegetation is no longer standing.
6. Frost, drying up or fine cobwebs in print can inform you about aging. Use also your fingertips to feel.



7. Rising vegetation inside prints can indicate aging.
8. Aging and color change inside individual prints are also important features. Notice in particular also the aging within a print in relation to pressure points/lobes and sides of the track. Here, a looser structure from “bursts” or pushed up soil will dry quicker than flattened, more moist parts of the individual print, such as the difference between a front lobe/pressure point and a heel.
9. Crushed insects, degree of fine-textured material potentially eroded or washed down – hence, differences in aging across the sign/print compared to your own fresh track next to it can provide indication of time since passing. Heavier markings in the print will persist a longer time, whereas fine patterns and fine particles erode more quickly.
10. Color change and moisture change inside track or in vegetation will tell you about aging in relation to temperature and exposure.
11. Not only sun, temperature and rain will influence the sign greatly, but also wind. Evening breezes can sometimes virtually obliterate sign in sand. In deep loose snow wind may cover sign, whereas print in shallow snow on exposed ridges will freeze and the wind will erode the snow around, leaving prints standing above the snow around.

Top, middle and ground sign and aging



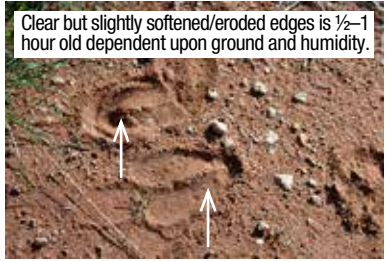
Remember to investigate the sign line – not just individual sign – for age. Judge humidity, weather, exposure and the ground – carefully noting edges, folds, transfer, lobes, etc.



Sharp rims in soft sand are very fresh.



Clear but slightly softened/eroded edges is 1/2-1 hour old dependent upon ground and humidity.



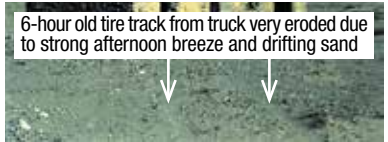
Carefully place your own print next to sign to help judge age.



Track investigated
Your own fresh track

Remember no "set" rule on aging – ground, footwear, weather, exposure to sun, wind and rain and temperature dictate aging process. Never judge age from one sign or track alone.

6-hour old tire track from truck very eroded due to strong afternoon breeze and drifting sand



"Butt" mark from man on top of an elephant track with beginning color change within sign shows already sign of aging as sun dries up.



Track in cold wet sand in shadow stays long – but drying up inside track and of transfer/bursts – 1 day old with beginning color change within track shows clear aging.



Track in soft sand in sun is slightly eroded, but caused by soft paw and soft ground – very fresh, still higher moisture in track even if in exposed sun.

Track through sand, grass and dry leaves partly eroded due to afternoon breeze



Protected more from sun and wind = clearer sign

Exposed to breeze = eroded



Some plants react instantly on disturbance – like *Mimosa pudica* – unfolding rate varies with weather.



Leaves of forbs still “crispy” and fresh in spite of sun-exposure



Brushed off water shows disturbance since last rain/dew formation. Pointers/flaggers such as bent grass and forbs will have dry under side if fresh, slightly older will be wet on both sides, undisturbed vegetation dry on underside



Transfer on dry, partly broken leaf is dried up but not yet blown or washed off



Fresh track with leaves still shining even though in sun and grass still bent at an abrupt angle at toemark



Stain/transfer on paved hot road – may disappear within minutes



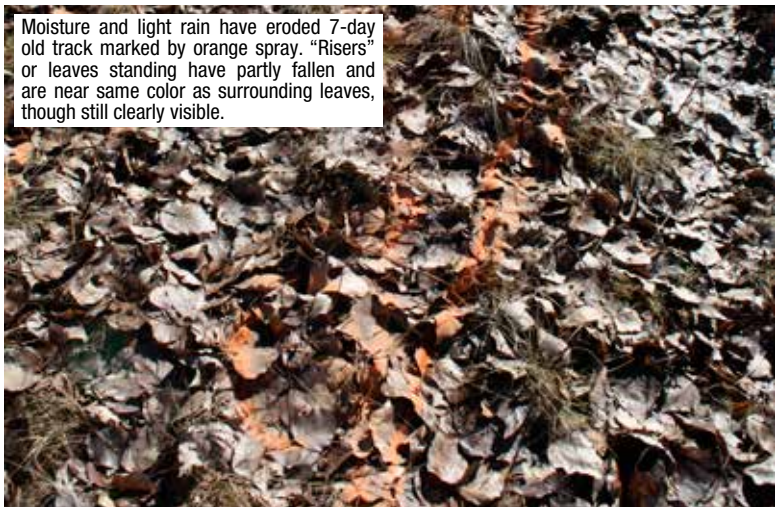
Rain has washed fine particles out of otherwise clear print, leaving coarser particles standing.



Rain and dew have washed fine particles out of 3-day old track in wet ground and eroded edges and pattern except in a very clear part.



Moisture and light rain have eroded 7-day old track marked by orange spray. "Risers" or leaves standing have partly fallen and are near same color as surrounding leaves, though still clearly visible.



Freshly broken twig still "white"



Freshly broken down herbs and leaf from herb show scar and also a broken leaf bent at a 90 degree angle, still in position



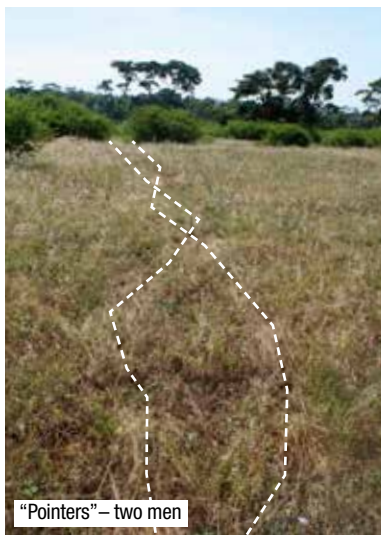
Aging disturbed lush “crispy” or thin-skinned riverside vegetation dries out very quickly in the heat. Time will vary with vegetation and conditions.



24 hours after damage on a thick-skinned drought-resistant plant normally in direct heavy sunlight and heat – much slower dry-up



24 hours after damage on a thin-skinned riverside plant normally in the shade



“Weeping” after cut, not discolored yet = fresh

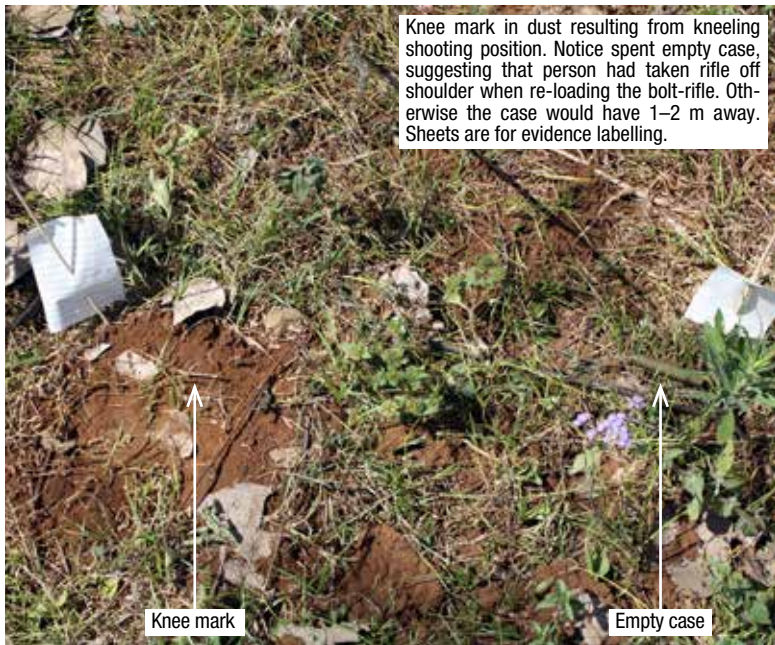


“Pointers” – many men



“Pointers” – one man





Crushed sand pebbles
resulting in "flattening"



"Flattening"



Crushed sand pebbles resulting
in "flattening" and slide mark



Varying texture and humidity in
soil causes track to be visible
with profile in dark areas but
not in light.



10

PATROLLING: LONG-DISTANCE TRACKING – VEHICLES AND ROUTES



In most instances you do not have a starting point at a crime scene and need to patrol large areas. Here, identifying natural routes and funneling terrain is important. Also notice that most criminals NEVER move randomly, but under the probability of not getting caught, which means their actions will be deliberate, targeted and can subsequently be predicted and intercepted.

Patrolling is neither restricted only to looking for tracks and sign nor obtaining a visual on suspects. Also beware of the environment signaling – vultures, eagles, corvine birds, any bird of prey or scavenger that will easily spot the least “out of order”. Furthermore, other wildlife, such as baboons will signal from afar any “intruders” – be it yourself or poachers. Ordinary birdlife often signals presence of “intruders” as well. All of this may help you locate sign or get visuals on poaching activity.

Long-distance tracking – vehicles and routes

Make good, solid and friendly interviews and use local knowledge on subjects, water, routes and traffic in area – invaluable!

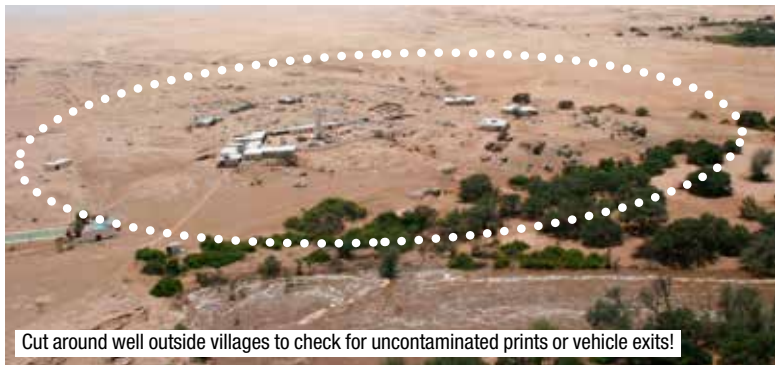


Check for natural stops, curbs of roads or on possible places for rests, urination, defecation or over-night camps, such as in farm buildings, ruins, abandoned houses and shacks.

Always check carefully at possible stops if subjects have left and returned to vehicles or if you can identify prints.



Look for natural travelling routes out of valleys – there are limited exit opportunities if using vehicles.



Cut around well outside villages to check for uncontaminated prints or vehicle exits!

Tracking vehicles and personnel from vehicles – locating sign

Dried out river beds – “wadis” – dirt roads and fire breaks are excellent track traps for perimeter cutting – sometimes even by plane, helicopter, vehicles, motorbikes or horses.



Kopjes, hills or woodlots are typical spotting or observation posts for poachers. Look for sign in such areas, and locate spoor.



11

MAKING YOUR PATROLLING MORE EFFECTIVE

A common challenge with long borders and large national parks is often difficult terrain, often rugged or forested and with limited infrastructure interspersed with small scattered villages – and a very limited number of staff, equipment and transport available. However, training of trackers can turn this entirely to your benefit. They are accurate, fast and light, require little or no gear and can conduct long-range patrols as individuals, pairs or as part of patrols, patrolling from vehicles, motor cycles and especially from horseback (excellent) or on foot. However, there are ways to increase your efficiency even more.

Firstly, divide your area into three types of landscape:

- 1. Dead zones:** These are any type of terrain where suspects are easily intercepted, and where movement is limited or exposed – open terrain, next to unpassable rivers or lakes, close to patrolled infrastructure, homogenous flat, sloping or open forest. In towns they correspond to open plazas, embassy quarters, wide avenues, highways and near airports, open parks or towards big rivers and beaches.
- 2. Tactical corridors:** Any type of terrain, such as wadis (dry riverbeds), ravines, and elongated wood/forest patches through open terrain, that will enable suspects to move quickly from a to b, typically from one safe area to another, but where their movement patterns will be restricted to the sides. In towns they can be smaller back-alleys, slum corridors or bombed-out chaotic stretches.
- 3. Safe zones:** These are areas where suspects/fugitives have multiple options for directional change, almost always rugged or undulating terrain, whether forested or not. If compromised, they can quickly move in another direction. These areas are like a fox-hole with many exits. If such areas are proximate to borders they are even more popular.

In towns they can be dense market places, big stores, heavily trafficked areas, suburbs and residential areas, rugged areas or areas with many small and winding streets or disorganised slum areas.

Patrolling dead zones: Any suspect will try and move as quickly as he or she can to safe zones and make “raids” from these. This means that the experienced CO should not distribute his or her patrolling resources evenly.

In or near dead zones there is often a prevalent infrastructure, such as tracks, fire-breaks, or sand bars, especially on river banks. These can either be protected from movement, such as river banks, or in terms of gravel roads, by active raking. Drag a log or rake after your patrol car, improvise so that you get a good even raking of the ground. If there are circle roads around the area you want to control these even better by raking. After raking, simply patrol the area and look for crossings, using vehicles, motor cycles, bikes, horses or ground patrols. Even if suspects try to wipe out their sign they will leave clear signs of crossing behind. The system has been used with success by the US Border patrol and is in common use around many military airports around the world and in some national parks. Correspondingly, patrols can patrol river banks and be very careful to maintain one trail of travel to avoid contaminating the track trap. Few patrols can thus control in- and exits of larger homogenous flatter sections of the national park, and where suspects cross, they are quickly intercepted.

Patrolling tactical corridors: These are somehow linear and can easily be guarded by observation posts and sentries or by checking for sign.

Patrolling safe zones: These are the most challenging and where the commander should intensify and concentrate the use of ground patrols. Remember that most will follow funneling terrain, even in relatively flat areas, and move either at bottoms or on ridges. Remember that even in a generally flat landscape, rugged or slight undulations provide changes in vegetation and provide cover. Be careful not to contaminate the natural funneling terrain but walk on sides or move in perpendicular to all “funnels” in such undulating terrain to check for sign of suspects or hostile activity. They will typically move in file formations and leave a lot of sign, like 5–8 man poacher patrols with 3–5 men armed, the rest unarmed in order to move fast and to carry water in and i.e. ivory out.

Notice that tracking here is used for gathering intelligence on in- and exit illegal activity – not just follow-ups.

Summary

- Rake and sign cut roads in flat terrain and use vehicles and fewer patrols here. If sign is intercepted, teams can rapidly be deployed or leapfrogged, and suspects apprehended.
- Intensify ground patrols in undulating and rugged terrain with constant 24 h cycles. Vary size, time and location of patrols, including entry and exfil points. 90% of insurgent or more professional poaching activity will be near or in rugged terrain, while ravines and similar are frequently used as tactical travel corridors. They will use such terrain near boundaries and borders for in- and exfil.
- Low level bushmeat poaching will frequently be near villages, bike paths, trails or roads.



12

REDUCING WEIGHT, VOLUME, WATER AND FOOD REQUIREMENTS ON LONG-RANGE PATROLS

“When we travel we only take a bag of rice, our AK (read AK47), 1–3 magazines and a machete”, he said, leaning against a tree in Sumatra, Indonesia. – “But if we are in a hurry, we only take the machete” he added, beaming.

A light, fast self-supporting tracker patrol is a deadly, effective opponent in the bush. A heavy, overloaded slow “modern” tech patrol is deadly only if chance-encountered, but highly predictable in its movements and operation, easily spotted either through movement or through vehicle or helicopter support, short-range – and thus easily avoided or ambushed. We will not here teach ordinary patrol skills and formations to be used, details of equipment, arms or the use of rallypoints and similar as most rangers and staff undertake such training anyway, but point out a few critical issues to be considered. It is up to the individual CO to follow their rules or set-ups of gear, arms and equipment according to their own systems. However, we would like to point to a few critical issues, namely the relationship between weight, water consumption, speed and efficiency of patrols when competing against lightly equipped, but not necessarily poorly equipped, poachers or militias killing wildlife.

Being light is essential for covering greater distances, investigating rugged and remote terrain and carrying out quick-follow-ups. Light gear also enables the patrol to move more stealthily and stalk where necessary, to travel during night when required even in difficult terrain and evade quickly if outnumbered.



Body armor, loads of ammunition, massive firepower, over-rigged and subsequently heavier assault rifles, heavy boots, big backpacks, handguns and multiple gear strapped to the legs, helmets and goggles and much more are NOT for long-range tracker patrols.

Instead, light footwear such as running shoes (except in extreme cold where other gear will be required), light field clothing, light rifles that each member is proficient with, gear with multiple functions such as wool and water proof ponchos (that can be used for shelter, rainwear, water gathering, camouflage, medevacs, makeshift rafts, sweater, blanket, sleeping bag etc.), heavy knives (use as axe, machete, etc.) and very light chestribs or simply 1–3 magazines maximum will provide a far more flexible, lighter and faster set-up. Small backpacks can be used to carry in food and water to caches, however, it is excellent to rely on set-ups that require no backpacks, leaving more ventilation for the back in hot areas. Indeed, ultralight belt rigs consisting of multiple water bottles, a knife, a pouch or shoulder bag for food, a light poncho, a small pot for cooking and other minor essentials will allow the patrol to move far, if required fast, and certainly in any terrain. The perception of a lightly clad American native Indian or San (Bushman) tracker with knife and shoulder bag, firekit and bow is a good ideal.

Gear

Uniform or clothing: Learn from the locals where possible. They know best. Many layers work best in the cold as you can regulate heat. Woven wool is superior to anything in temperate to colder climates as it breathes completely far beyond both cotton, blends and modern tech materials, warms when moist or wet, dries fast (woven not knitted), although you may need a windbreaker or rainwear/goretex in extreme weather conditions. But do not wear these all the time as you may sweat and overheat. For camouflage, worn and lighter colors are far better than dark. Coarse colored patterns are much better than fine as they will break up your outline better at 30–50 m and more – modern, fine-textured materials become a blur at greater distances. Wool is dead silent, and cotton is near silent. Technical materials are noisy. Shorts and light shirts work just fine in jungles, you can see the leeches immediately. Otherwise make sure your clothing is closed. The shemagh in desert regions has to be full size to be used correctly. Covering or closing your mouth will also reduce water loss. Much can be said, but the less gear you carry the more important is your choice of clothing. If you are light you can move much greater distances and use fires to dry your gear, provide heat and cook safely. If you are heavily loaded down you cannot move far and will have to be on “hard” routine (i.e. no cooking), need sleeping bag, mat and more or even a stove to avoid detection. So being immobile increases the gear needed further – and not necessarily comfort one bit.

Footwear: Running shoes or very, very light boots are best. Many of today's offroad running shoes are so stable and strong that you find types that will stand the bush-environment and provide the necessary stability. Many guerilla wars were fought barefooted or in sandals. Avoid stiff-soled and heavy ankle support boots, you make more noise when walking, it is more difficult to place your foot precisely and your joints were made to be flexible. Heavy boots will tire you and strain your knees. 1 kg of boots is equivalent of 5 kgs in the pack. In jungles running shoes of rubber similar to soccer shoes are great. Train in rugged terrain off-road, never on roads. Running, and especially learning how to walk in rugged terrain, is perhaps one of the most important features of a long-range patrol.

Chestriqs and packs: Make sure that they are strong but extremely light. Do not use vests in hot climates but open systems that concentrate around your hips, otherwise you overheat. Make sure that you have your essentials including water and survival gear in chestriq and a short pack, so if you drop pack you still have your main gear. For back-

packs, make sure they are strong but light. Most modern backpacks are surprisingly heavy and oversized. If possible avoid backpacks at all but use slightly larger chestribs and a shoulderbag for food. You will be faster. Carry gear and water into caches instead. You do not need a tube to drink to survive or even be effective.

Food consumption on patrols: Careful consideration should be given to choice of field rations, as using a standard everywhere in all climates give you problems in terms of increased need for water and excessive overheating – or cooling.

1. In cold climates you need a lot of energy and especially protein, as near half of the energy in protein is converted to heat. The same is true for eating at night when sleeping in cold deserts.
2. In hot arid or humid areas you should focus on carbohydrates and minimize protein intake. Furthermore do not eat in the mornings and during day except for a few biscuits. This will reduce your water consumption further.
3. Avoid extreme excessive energy expenditure but rather move steadily, burning fat. The former will fast deplete your glycogen reserves, around 500 grams in muscles and some 100 grams in your liver. In comparison, your fat reserves are probably around minimum 10 kg in a normal athlete, and as the energy in fat is twice that of glycogen your energy in stored fat is at least 20 fold higher than that of glycogen. In other words, move steadily and for a long time rather than sprints and bursts of energy when patrolling, or hauling of heavy gear.

Water use: You spend ca. 0.1–2 liter water per hour, dependent upon temperature, humidity, intensity of physical activity, food consumption and whether or not you have a backpack. Water use increases with backpack as you sweat more.

1. If you carry closed up clothes or body armor, boots, a heavy chestrib and lots of ammunition, a big heavy backpack, eat protein in the morning and operate in a hot climate, you will easily need 8–12 liters of water per day.
2. If you carry light clothes, running shoes, very light or no gear and do not eat during day or mainly consume light carbohydrates (like rice or biscuits), you can lower your water consumption down towards 2–3 liters per day while still on the move.
3. Place water bottles and jerry cans with water in caches with biscuits so that patrols can roam up to 3 days without backpacks or resupply. Without backpacks they reduce water consumption, increase stealth and mobility, and ultimately enhance both security and chance of apprehending or intercepting poachers.



©Michael Nichols, National Geographic

By combining the right gear, food and water strategy, your speed and distances travelled also increase:

Speed per km: total weight x 10 seconds

If you weigh 70 kgs you will move approximately $70 \text{ kgs} \times 10 \text{ secs} = 700 \text{ seconds} = 11.7 \text{ min/km}$ in easy terrain. If you add 30 kgs of weight in a backpack/chest rig you will lose $30 \text{ kgs} \times 10 \text{ secs} = 300 \text{ seconds} = 5 \text{ min/km}$ slower than the above – or spend at least 16.7 min per km.

Footwear is critical. You lose ca 10 seconds per 100 grams your pair of footwear weighs:

A light running shoe: 400 grams per pair = $4 \times 10 \text{ seconds} = 40 \text{ seconds}$ slower per km compared to bare foot. “Light” military desert boots: 1200 grams per pair or $12 \times 10 \text{ seconds} = 120 \text{ seconds}$ or 2 minutes slower per km. A heavy mountain military type boot: 2 kgs or $20 \times 10 \text{ seconds} = 200 \text{ seconds}$ or 3.3 min slower per km – which means running, the guy with the heavy boot will invariably be near one km behind after the first two km – or worse – overtaken already after 1 km, assuming pack and chest rig had been dropped, that is.

If moving tactically or in other terrain (see table in chapter 2), much more. In addition you have to add more weight to carry the extra water needed, and, hence reduce speed further. In other words, if you carry full modern chest rig of 25 kgs and a 50 kg pack, not uncommon with special forces (some even 100 kgs!) with supplies etc, you will move $75 \text{ kgs} \times 10 \text{ secs} = 750 \text{ sec}$ or 12.5 minutes per km slower than your adversary without the pack, plus you will need a lot more water – making your pack even heavier and slowing you down further, expending more energy also, and making you require more food to carry, becoming less mobile, so you cannot use fires for cooking or heat and so on. And you just lost the initiative.

This means that across a stretch of 10 km you will already have to carry 3–7 liters of extra water and be over two hours farther behind the quarry than when you started. As many poachers – and guerillas for that matter – will easily walk 30–60 km per day dependent upon terrain, not only will you not be able to make those distances, you will after only 30 km be at least 5–15 liter of water short (like a jerry can) and an additional 6–24 hours farther behind – at least. With the heavy weight you also tend to select more easy routes and become more predictable and increase the risk of walking into an ambush or booby trap.

So if you want efficient patrols, they must learn to “starve” during day, eating only a little biscuit or similar to avoid using up their sugar body reserves moving light and steady but avoiding extreme excessive energy expenditures to burn fat mainly, carry no backpack, take 1–3 magazines if armed, and store caches of particularly water and a little food at 2 day intervals throughout the park. They must also use running shoes, or for those who are used to it, go barefoot.

In addition, use the trackers or other members of the patrol actively as lead scouts, sending them far out in advance (see warning further down – this is for experienced rangers only).

- Patrols should be as light as poachers – for field patrols dismiss army boots but use running shoes or if trained even bare foot patrols where relevant.
- Maintain (rake) and avoid contamination of track traps at all times as these can be used to determine insurgent/poacher movements/traffic
- Establish tracks and fast infil methods to deploy patrols near rugged terrain along borders

Warning: Light, long-range patrolling and the use of sending out singular or “twin” lead scouts require extensive training. Lead scouts in particular should be the most field competent and experienced staff as these are very exposed in case of contacts.

13

COUNTER TRACKING

Counter tracking (confusing sign in the attempt to fool tracker) and anti-tracking (minimizing sign, laying ambush and booby traps) are methods employed by criminals, guerrillas and poachers to gain time or reduce the ability of the tracking team to pursue, locate or apprehend the fugitives.

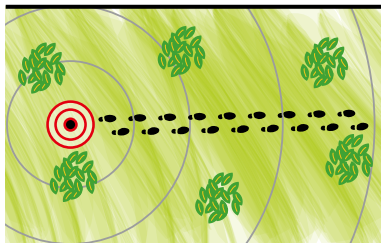
Unlike common belief, and as is shown again and again in areas with tracker units, it is extremely hard to evade a professional tracker team. While dogs are generally more easily evaded across greater distances, such as by either gaining distance, tiring the dogs (K9's), moving in terrain impassable to K9's or confusing the K9 handler to make believe that the dog has lost trail, thus breaking the bond between the handler and the K9 - a tracker team and especially a combined K9-Tracker team – is extremely hard to evade. Even in today's technological world, there is no harder or more dangerous hunter force than a combined K9-tracker team, especially if with logistical support, provided that the team is light, fast and well-trained. They will move fast with the K9 on spoor in good conditions, pick up the correct spoor and sign when dog loses it, can leapfrog both K9-units and trackers further out and assign them to the correct spoor using perimeter cutting, and will predict the actions and routes of the fugitives, utilizing the best of both man and dog in pursuit.

Most “tricks” of poachers in evading will usually cause the poachers to lose time in evading, may fool a no-vice, but has very little effect on an experienced tracker. The time spent in employing these methods will delay the fugitive and simply cut down the time-distance span to the benefit of the pursuers.

Advanced evasion techniques are an entirely different matter. Having worked with poachers and guerrillas in 4 continents, I have learnt that there are a very few that have refined and developed a unique set of evasion skills making them extremely hard to catch whether in urban or bush environments. These are not skills taught by police or the military, although employed by some guerrilla units around the world. For fear that

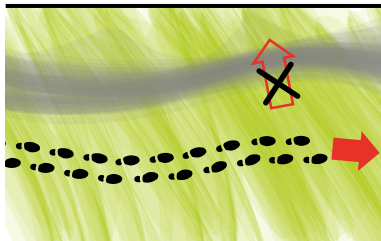
they should become common knowledge we will not disclose them here. In the following, the most common counter tracking techniques employed are described, and as the developing tracker will realize, they are easily countered and have minimal effect on a trained tracker team.

In most cases the time allocated to minimize or even attempt “smart” counter tracking will only delay the fugitive further and reduce the time-distance gap between hunter and fugitive. The list is not complete or exhaustive, but demonstrates why the training of trackers should include both learning how to see and tactical understanding.



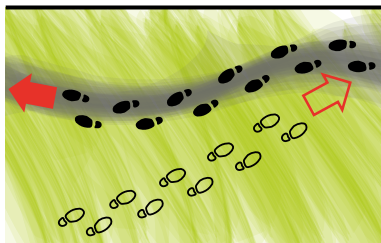
DD – Distance does it: The poacher will attempt to move as fast possible away from crime scene.

Remedy: Use perimeter cutting and leapfrog teams.



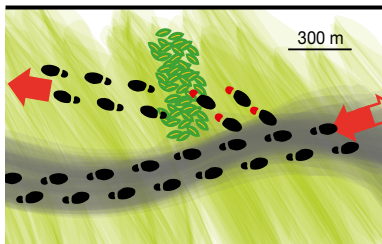
The wolf: Suspect will recce or move parallel to linear features to avoid crossing or to navigate easier without crossing.

Remedy: Search track traps that cut across perpendicular to infrastructure or trails, especially in funneling terrain.



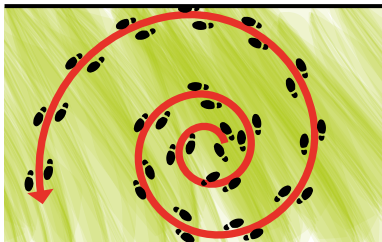
The backslip: Suspects will gradually illude movement in one direction, like when approaching a trail, then abrupt turn back in opposite direction once on hard ground/trail.

Remedy: Cut ahead in track traps, if negative, cut along sides in track traps.



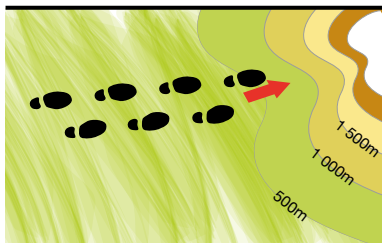
Big tree: Suspect will continue in one direction, then turn 180 degrees around on hard ground/road walking back or backwards, then jump off trail where a tree or big rock will hide exit from trackers coming on spoor behind.

Remedy: Cut in track traps ahead, if negative, cut along sides for signs of exit or cut parallel to trail in track traps in bush. Look for twists in track or “kick-off”.



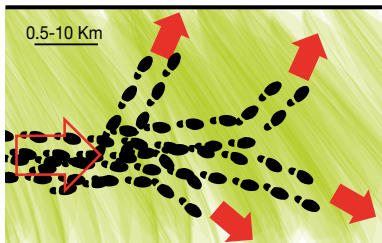
The circus: Suspect(s) will run around in irregular circles or irregular manner in several hundred meter radius in hard or dry ground or vegetation, where tracker or K9-handler will expect dog or tracker to loose signline – the irregular pattern provides just that impression.

Remedy: Cut around diffuse area and look for sign in funneling terrain.



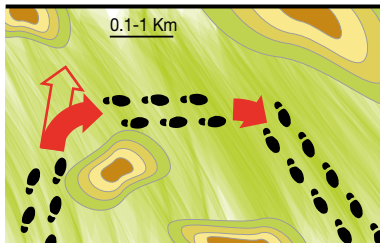
The mountain goat: Climb or move in difficult terrain that restrains dogs or trackers.

Remedy: Cut around or check for funneling terrain beyond, suspect will become delayed.



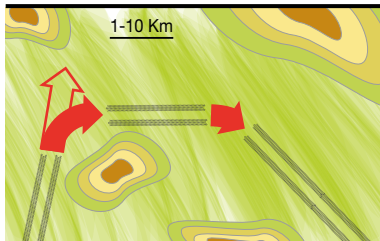
Forking: Suspects will gradually split up from a team into smaller and smaller units.

Remedy: Assign some to trail, cut ahead for track traps and funneling terrain, or back trap to investigate where suspects came from.



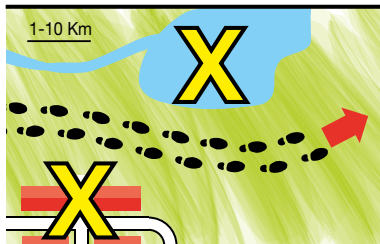
The bunny: Difficult one: Suspects suddenly change direction entirely when out of sight on hard ground to move in entirely new direction. Name comes from the movement of hares or rabbits when fleeing.

Remedy: Cut around where sign is lost using track traps, also moving backwards, to determine new route.



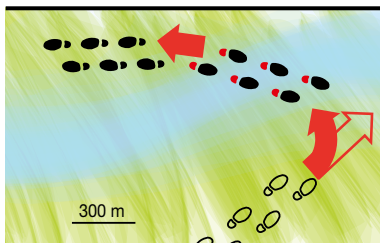
Giant bunny: A bunny across several km.

Remedy: Difficult one. Cut ahead using perimeter cutting and extend these by “closing the gate”.



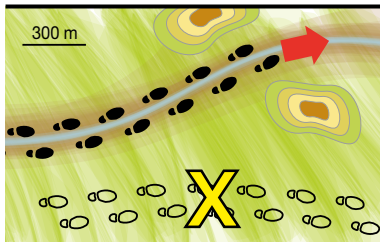
No go or Dead zones: Suspects will avoid all homogenous, flatter or open terrain, near impassable areas around lakes or in gullies or other dead-ends, as well as terrain close to infrastructure.

Remedy: Intensify ground patrols in rugged terrain and use raked gravel roads, river beds or other track traps to control in- or exit from dead zones. Suspects found within/crossing such areas are easily apprehended.



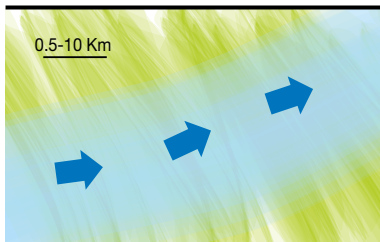
Slip-the-stream: Suspects travel through water especially where streams fork or split up to hide direction to trackers or especially dog.

Remedy: Travelling in water also leaves sign, especially top sign and when leaving streams into sand bars or lush vegetation, it slows down speed of travel and often routes and streams are very limited in direction.



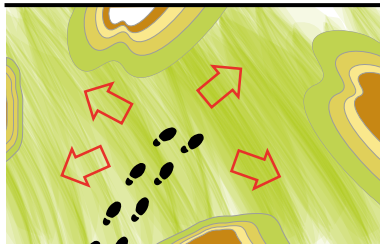
The cougar or The leopard: Suspects do like many predators – they slip into wadi's (dry river beds), gullies, ravines or other elongated depressions or small narrow belts of vegetation to “slip” through or across open “dead” terrain.

Remedy: Sign cut particularly intensively along such natural travelling corridors. Remember that suspects always move under the probability of not getting caught or being seen, hence, routes can easily be predicted.



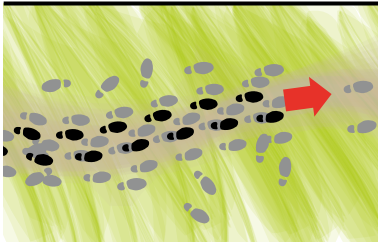
Huckleberry Finn: Suspects will float, swim or drift down larger rivers, typically at night.

Remedy: Keep a close watch on all larger water ways in non-obvious spots, one place is usually enough. Sometimes suspects may disembark at turns, cut across to next bend of a meandering river, and continue from there.



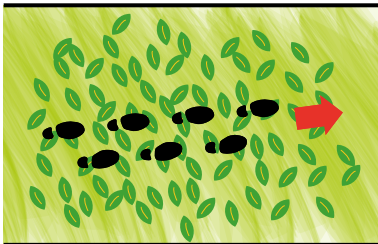
The foxhole: Difficult one. Suspects use primarily rugged terrain, where they at any time have multiple exit opportunities and opportunity of directional change if compromised.

Remedy: Use track traps to control surrounding dead zones and intensify ground patrols in just such areas. Suspects will often for ease of travel tend to use funneling terrain within such rugged terrain, and have lay-up-points or sentries on entries to valleys or on view points, these places are easily checked for sign.



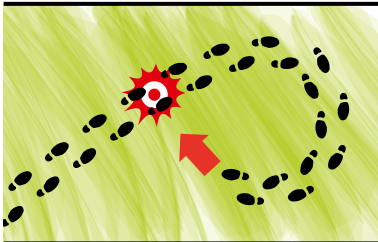
The highway: Suspects will move onto a very trafficated trail to hope that their sign becomes mingled with those of other people or traffic.

Remedy: Check for sign and prints especially at outlets and junctions or at entries to buildings of suspects. As soon as they leave trail they are much more likely to leave sign. Cut ahead and cut along sides to check for exits. It can be surprisingly effective to cut for partial prints around houses, corners, junctions and road sides even in urban areas, especially since suspects soon will try and move away in order not to be seen by witnesses and will select a more discreet tactical route, where their sign can be re-located. Works well in bush villages in tropical or desert regions or in northern regions during winter, but also sometimes even in major urban areas.



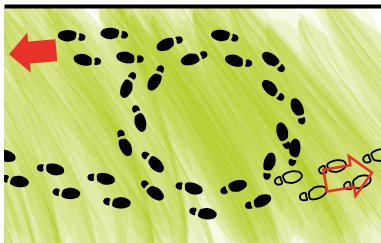
The bush-wagger: Suspects will move or even create “circus” inside dense vegetation to restrain dog on leash.

Remedy: Simply cut around in track traps and search for exits.



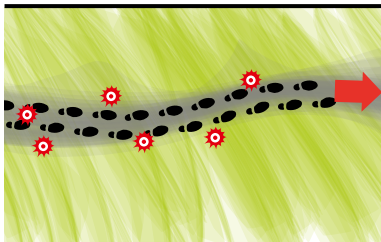
The fish-hook: Suspects will move around in a semi-circle to watch their back-trail or lay an ambush.

Remedy: Use flankers or Y-formation, especially in obvious locations, to provide flank security.



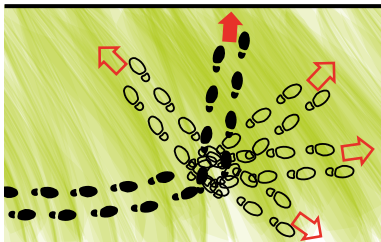
Arctic circle: Suspects will make a turn on the trail and onto main trail, and use this turn to jump off.

Remedy: Any such action is immediately picked up by tracker as suspicious. Also look for twists in track or “kick-off”.



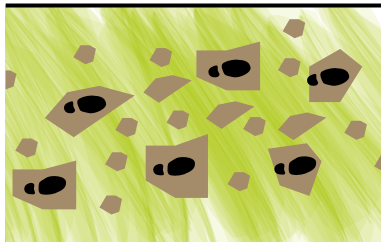
TTT – Trails trigger traps: Suspects may follow very obvious major route and place booby traps.

Remedy: Booby traps are rarely, if ever, placed randomly, but typically in downhill direction, within 0-30 m at entries to trails, entry into vegetation, in ditches where you jump across or at river crossings, in other words in funneling terrain. May be placed with trail leading into “horseshoe” with one mine in middle, others around in a horseshoe so that fellow troopers will move to the side when triggered and into new booby traps. They are often marked by tree sign, small rocks in pile or grass twisted together at entries to such trails.



Bomb-burst: Suspects may bomb-burst, that is split up in multiple directions at once.

Remedy: Select some and go for them, or cut ahead or back track to determine origin before suspects entered crime scene, even outside area of responsibility.



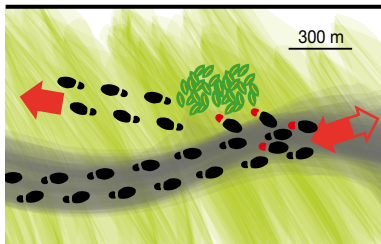
The kangaroo: Suspects will jump from one rock to another or move across hard ground to minimize sign.

Remedy: Simply cut around looking for track traps as they will have to exit hard ground.



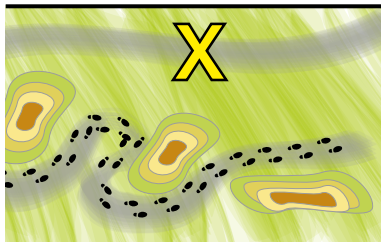
Cut-the-corner: Suspects will cut the corner around junctions as these are often watched.

Remedy: Place sentries or cut for sign parallel to trails and roads and especially check for sign at obvious observation points as suspects will recon junctions in advance and make more sign.



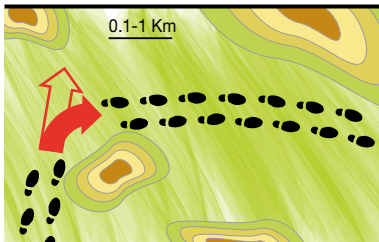
Big tree split: Suspects will try and split up in river or by jumping off trail behind tree or rock.

Remedy: If you suddenly encountered reduced sign, have one tracker cut for sign along track traps parallel to previous spoor and pick up exits. Suspects will often leave more sign after a few hundred meter if they feel safe. Also look for twists in track or "kick-off".



No-way: Suspects will take a very un-natural or difficult route.

Remedy: Always check for sign in funneling terrain as such routes tend to have few entry or exit opportunities.



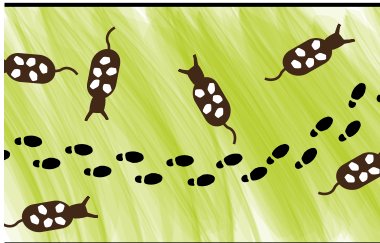
Trail-break or Semi-bunny: Suspects may attempt to suddenly change direction.

Remedy: Simply use lost-track techniques and go backwards and cut for sign to sides.



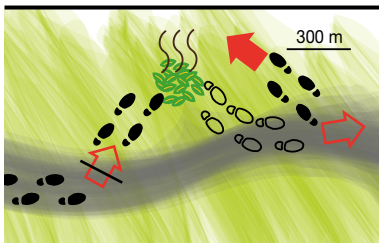
The caribou: Suspects will try to be constantly on move even if contained in a limited area.

Remedy: They will leave more sign, cut for sign ahead and get K9 patrols in that are faster at short distances on fresh spoor.



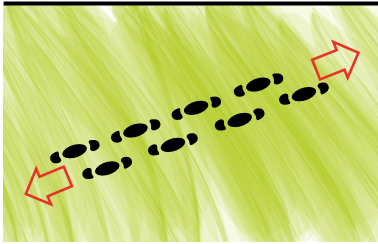
The cow-buster: Suspects will run through areas with livestock to scare or discourage dogs or reduce their own sign.

Remedy: Handlers will simply cut around, trackers will often find more sign as livestock trampling will create track traps or dung. May even increase smell of suspect. May discourage dogs but have little effect on tracker, as they will cut around also for sign of exit.



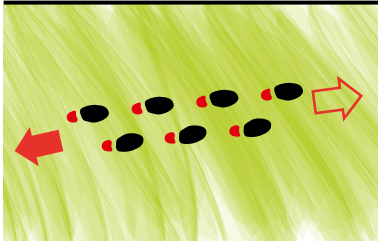
The dump-jump: Suspect will jump off trail where they have gone aside from trafficated trail to defecate or urinate in the belief that the tracker will take such a site as "private".

Remedy: Little effect, the tracker tend to particularly investigate such sites for further information, so poor place to jump off.



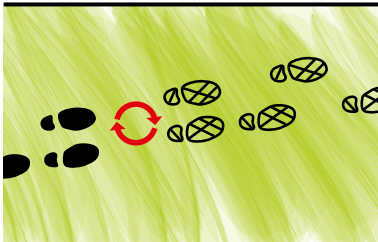
The masai sandal: Suspects may use sandals that are rounded in middle and are cut square in both ends to hide direction of travel, or even tie animal hooves under their feet.

Remedy: This has very little impact on tracker. Tracker will also look for sign showing direction, and of pressure points inside each sign and print indicating direction of travel, and suspects will also leave shorter strides going uphill and longer going downhill. Animals do not walk like man.



Walking backwards: Suspects may attempt to walk backwards across a road to hide direction.

Remedy: Firstly the sign and pressure points become different when you walk backwards, but sometimes this can be less clear than one would think. Stride length also becomes shorter. However, most importantly, as soon as suspects are in vegetation they still leave sign of direction, furthermore they will soon turn around and walk normally. Simply follow sign a bit into vegetation before you report sector.



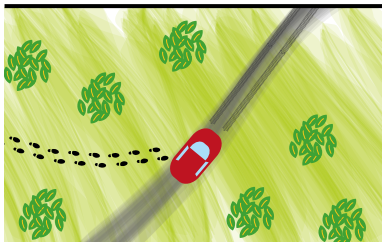
The shoe-maker: Suspects will change footwear or add cover shoes to confuse tracker.

Remedy: Firstly, no one can fly – so if a track disappears and you fail to retrieve it using lost-track techniques, they will have shifted foot wear. Cover shoes leave larger prints. Simply measure length of all prints in a circle and look for new pattern or track. If suspects, as is often the case, move in vegetation, being even just a little, they will leave sign, such as pointers, flattening etc. Changing shoe has little effect. No matter type of footwear they will still leave sign.



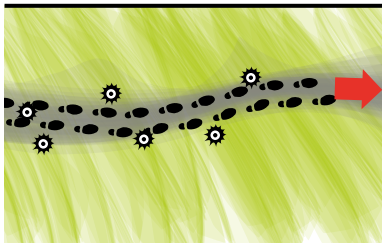
The tree-hugger or False sign: Suspect will try and rub against tree in the hope that the dog will tire from constantly marking smell of suspect or break vegetation in false direction.

Remedy: This will only encourage dog. Secondly, a lot of sign will only make tracker suspicious, and when sign is lost tracker will move back on spoor and find exit.



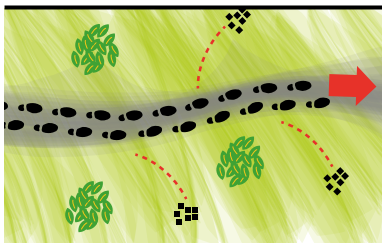
The ride: Suspect will use bicycle or vehicle to gain speed.

Remedy: This may or may not actually limit directional movement as trails and roads may have limited options. Easy to set up vehicle check points. If in terrain, tires will leave even more sign to follow, and routes be more limited. Using estimated speed and direction, there will be a limited number of bicycles or vehicles leaving a limited area and a limited number of options to check.



Pepper: Suspects may throw pepper in track to hope to destroy smelling senses of dog or put out fishhooks with fishline to slow dogs.

Remedy: The dog will simply walk around strong smell and fish hooks will usually only catch fur and not be a major problem.



False items: Some may throw piece of gear from another person that they brought along in a plastic bag in the hope that the dog may follow this item instead.

Remedy: Most dogs will pick up the scent in the air or above vegetation, or smell and focus on broken vegetation or disturbed soil.

Most SERE (Survival, Evasion, Resistance, Escape) training courses even for professional modern soldiers are focused on survival, resistance and a little escape, and sometimes a little counter tracking. Real evasion techniques are only taught by a few guerilla units, mainly in Asia, simply because it is their primary tactical tool, which is one of the reasons why traditional armies face such hard times in guerilla wars.

The ability of trained trackers to also predict movements of suspects and quickly understand their mindsets is very important. When you track you follow the exact routes of the suspect down to the least movement and become attuned to the suspect's behavior to the least detail. Hence, your ability to understand the suspect's mindset increases along the trail and thus also your ability to predict the suspects choices ahead. It is mainly due to this purely practical effect, not any supernatural instinct, that trackers sometimes can relay accurate projections of future choices made by the fugitives.

14

NATURAL NAVIGATION

Maps are the cornerstone of any good operation. In spite of the availability of GPS, maps and compasses, natural navigation is an extremely important tool for trackers and ground patrols. And in some parts of the world, maps are not always readily available. This chapter provides a summary of some of the principal ground-tested methods in natural navigation that can help make tracker teams and patrols more proficient in navigation. Work with the locals, if indigenous people are not used to topographic maps, simply build small landscapes with sticks and rocks. They can draw or make astonishing accurate maps including position of small springs or water holes frequently not on maps. Knowledge of small water sources in drylands is invaluable.



©iStockphoto/Howard Oates

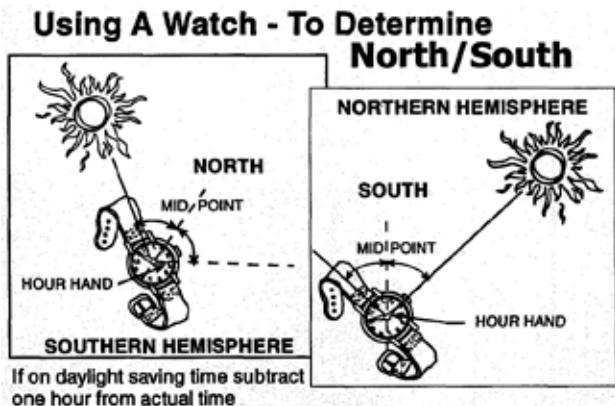
LANDBASED NATURAL NAVIGATION WITHOUT MAP OR COMPASS – AWARENESS BUILDING

There are a few very simple methods to learn - but they must be practiced. Most important are learning to observe the sun, vegetation, dominant wind direction, learn to use “home-center” navigation and finally speed and time passed. With training you can navigate extremely effectively without GPS, compass, map or other aids – in many cases faster and easier. If compass, GPS or even sometimes maps were critical operational tools, guerillas would acquire them and use them all the time - but they don't, simply because they don't need them. COMBINING MAPS, WATCH, COMPASS AND NATURAL NAVIGATION IS THE FASTEST AND MOST SECURE WAY TO NAVIGATE – MUCH FASTER THAN GPS EXCEPT IN THE OCEAN.

1. The sun is your most important natural navigation tool, and you rarely need anything else. Firstly, it is ALWAYS located exactly SOUTH at noon at northern latitudes (NORTH in southern latitudes), and moves from EAST to WEST during day. The sun is due EAST at 0600 and due WEST at 1800 in mid-March and in mid-September. In mid-winter and mid-summer it is at these locations 1–2 hours before these hours

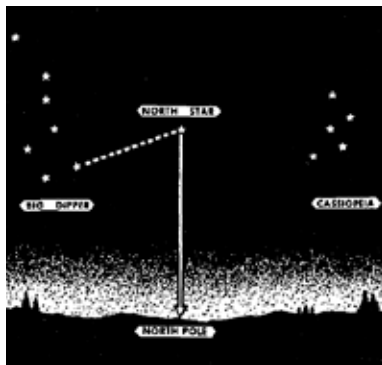
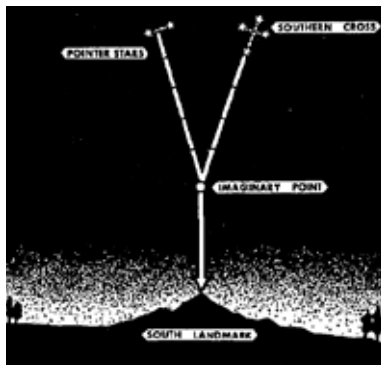


- (up to 24 degrees off!). But ALWAYS in due south (or north) at noon – and exactly right above you (Zenith) at the equator. At midnight it is in the NORTH at northern latitudes, opposite in southern latitudes (NORTH at noon and SOUTH at midnight). The sun always moves with the clock from left to right when facing it in the northern hemisphere and from right to left when facing it in the southern hemisphere.
2. BEWARE that your watch time can be pre-set to Daylight Saving Time (DST) or “summer time”, and that some countries for practical reasons have very wide time zones. Know your “real time” in any mission area – you may need it!
 3. If you place your hand with fingers horizontal with outstretched arm, and you count the number of fingers between the lower line of the sun and the horizon, the sun will set in time calculated as number of fingersx20 min at higher altitudes – at low altitudes each finger only counts 5 min. Beware that in the tropics it will become pitch-dark 30–40 minutes after sunset.
 4. When you walk through the forests or in the bush, always notice where the sun is shining on you and the shadow from the trees, and this will help you keep your direction with some feeling of your speed and time spent. Remember that the sun will move too – 15 degrees per hour. Get to use the sun as a habit and you will rarely use a compass. It can be highly accurate with training.
 5. Beware that the shadow from the sun is shortest at noon. Also beware in equatorial regions, the shadows will nearly point nearly EAST-WEST, so all you got to know there is whether you are before or after noon! It is hard to get direction from the sun in other ways in the equatorial belt, while it is VERY easy in the north.
 6. Use your watch to determine direction: point the hour hand (short arrow) towards



the sun. A NORTH-SOUTH line can be found midway between the hour hand and 12.00 o'clock. This is true at northern latitudes (north of equator). If you are SOUTH of the equator, point 12.00 o'clock at the sun and you will find the NORTH-SOUTH line midway between 12.00 o'clock and the hour hand. BEWARE of the inaccuracy during mid summer and mid winter.

- Learn to move and navigate by the sun – if its your left if you walk for one hour only, then it should surely be on your right when you walk back! This can be surprisingly accurate, particularly in forests or rugged terrain with multiple obstacles where people often get confused even with compass.
- You can also use the sun by NIGHT by observing the moon. Remember than the sun will be in the NORTH at midnight 24.00 when at northern latitudes, and in the SOUTH at 24.00 when at southern latitudes. So how find the sun? If you have a moon, simply determine from where the sun is by looking at the moon – at full moon the sun will obviously be shining on the moon from right behind you when facing the moon – if you can only see a small part of the left-side of the moon, then the sun is obviously shining from that direction. Imagine the sun like a flashlight shining at the moon and find out here the sun is – and simply use your watch again as if during day.
- Stars: You can also use the stars to find directions. At northern latitudes, the entire star system circulates around the Pole or North Star – it is always in the north. Locate Cassiopeia or the the Big dipper or the Orion and you can easily find it (see drawing). At southern latitudes it is slightly more difficult, but you can still find directions by the Southern cross.
- If you can measure or estimate the angle between the North star and the true horizon, it is also equivalent to your latitude directly – though this is generally of less value.





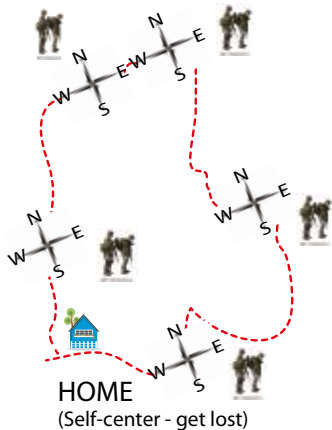
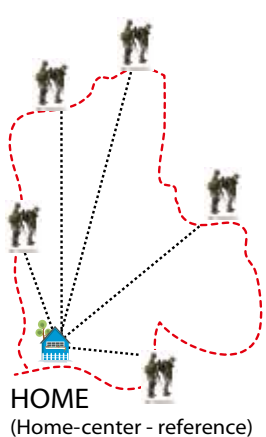
11. When it is cloudy and overcast – and you cannot see the sun clearly, or when the terrain makes it hard to have any focus (flat), pick a point on the sky – day or night, but beware that stars “move” as the Earth rotates, as do clouds, so you will have to adjust course now and then. But you will normally find a landmark, see the sun or moon with some hours in between.
12. Time and speed: Always beware of time passed with regular travel, if possible, and estimate your speed from your training, condition and terrain. This is particularly important in the dark and in forests and jungles or deserts with few landmarks.
13. If it is dense fog or extreme and you are not in immediate danger of capture or other exposure, simply stay put and rest, your speed may be extremely slow anyway in those conditions.
14. Vegetation: Observe vegetation and get known in the region - is the lush vegetation on south- or north-facing slopes?
15. Wind: Is the dominant wind from one direction affecting tree growth and plants - reeds with heavy flowers bend away from wind with flowers on lee-side. Trees bend away from the dominant wind direction. Get to know primary dominant wind

Moist green on north slope



directions in deserts – the dunes will be formed in this direction. A similar pattern can often be seen with snow. You can use this to navigate also in extreme weather by either watching the wind on you or your skis, or better, notice snow drifts and sand dunes. Remember they are hard on wind side with ripples, soft, loose and often steep on lee side – but hardness is important, sometimes snow accumulates on the lee-side in long softer pattern!

16. Birds, insects and animals often migrate to water early morning or evening – get to know their patterns and look for trails.
17. Most anthills are typically located on south-facing slopes at norther latitudes. Many type of termite hills, trees, cacti and other point or have roots in one major direction – like compass trees, the north pole plant of South Africa etc.
18. Most cacti – incl. the barrel cacti – lean towards the main sun (south in northern latitudes, or north at southern latitudes).
19. Notice main direction of larger rivers in region.
20. Home center navigation and dominant landscape – in terms of tens and hundreds of miles - and navigate by that.



21. Do not use “self-center” navigation, but “home-center navigation” -how are you moving in relation to major valley or your camp, even over several days – imagine where it was in relation to you at any time by an invisible “cord” – not where you were 5 min or an hour ago – and navigate by this big pattern. “Western” selfcenter is based upon straightline azimuths, compass and grids on maps.
22. Always look for landmarks and look back to recognize passes, trees, rocks or certain villages.
23. “Aim-off” when walking towards known linear objects – if you aim 2 km to the right of a village on a river, you know that you will have to turn left when you meet the river.
24. Urban areas: Look for major TV-antennae and get to know their location in town. All TV-antennae will be pointed in that direction. Large TV-antennae often on hill tops or high buildings – easy to spot.
25. Look for churches, they are generally EAST-WEST with tower most common in the WEST. In Mosques the mihrab is a niche in the wall, with a roofed area in front and no doors, pointing to Mecca.
26. Learn direction of rivers in town or location of slum, embassy, industrial, dwelling and business areas, market places, sights.
27. Use the sun, moon, stars or direction of shadows to determine your bearings if chaotic.
28. Use the “home-bearing” principle also in urban areas and count streets and left-right if possible, or lights or round-about.

NATURAL NAVIGATION – ACROSS DIFFICULT TERRAIN

In most types of terrain and weather conditions you will be able to locate the sun, the moon or some stars. The sun moves from LEFT TO RIGHT when facing it in the northern hemisphere and from RIGHT TO LEFT when facing it in the southern hemisphere. At equator, it moves directly east-west across the sky, with the sun in Zenith right above you at noon – true during fall and spring, but will be off 23.5° at the most during summer and winter due to the “tilting” of the earth – which is what creates the seasons. The earth rotates around itself in 24 hours – with the result that all sky objects – except the North star – appears to move around you in a precisely 360 degrees circle in 24 hours. This means that the sun moves exactly 15 degrees per hour. If you stretch out your arm with slightly spread fingers, this corresponds to how far any sky object—such as the sun—



moves in 1 hour. To test it and find the right “width” of you hand, simply choose an object at the horizon, put you hand on an extended arm next to it, and move your one hand after the other around in the full circle. If you get exactly 24 “hands” when you are arriving back at the starting point, you have found the right width of your hand to determine exactly how far the sun will move in one hour. One finger equals ca. 5 min or ca. 2°. Be advised that you must project the movement of the sun or stars where you are - at high latitudes the sun moves along the horizon, at equator it “rises”.

If you walk through difficult terrain, and you know your main course to destination (by compass, GPS or by having identified a route from observation from a viewpoint, or from natural bearings, all you have to do is to determine the angle (azimuth), the angle of your movement in relation to the sun (fex “the sun is shining at me on my right shoulder), and then steer according to the sun as you move through the terrain on your course. Every one hour, the sun will have gained another 15 degrees, and you will need to adjust this accordingly as you walk. If your direction is i.e. towards the sun, then after one hour you will have to steer 15° to the left of the sun in order to maintain the same course (in the northern hemisphere when facing the sun, opposite in the southern hemisphere). Even if you have a compass, this is far faster and more accurate than relying on your compass alone, as the multiple turns and barrier crossings will otherwise bring you off-course, with growing errors. You can also use the sun to determine how far you are travelling by estimating your speed per hour and the movements of the sun. As you can almost always see the sun or another object in the sky, you can move alot faster, gaining distance rather than constantly checking your course.

A surprising feature of this method is that you can even use it combination with GPS and compass to determine initial route or course, but you only need to verify your course at long intervals. In difficult terrain or flat or forested landscapes, this system is far superior to any other navigational system. Remember that time zones, summer zones and declination can make big errors from “real” the noon or “real” midnight – where the sun should be in the north or south – by up to 2–3 hours. Learn what “true time is in the area that you operate. It is the time when the sun is exactly in the true south or the true or north. Learn to understand the movements of the sun in relation to time passed and angle of the sun and time of year and latitude – there is an obvious relationship that once when understood roughly, you will have an eternal compass in the sun, the moon or the stars. Beware that at high latitudes the stars are moving nicely in a circle around you – whereas in equatorial regions they tend to “rise”. This requires practice. When you observe the moon, you can determine the exact position of the sun “shining” on the moon like a big flash-light – and determine compass directions.



One variant, slightly more tricky, is to use a moving object – preferentially as stable as possible – such as a cloud in the sky and steer by that. In such case you have to adjust course about every 15 min, however, it does allow you maintain speed. Another practical tool to estimate time to darkness, is that the sun drops with approximately 20 min per finger set below the sun and the horizon at higher latitudes, while at equator each finger is only about 5 minutes (or use your extended hand like for determining 1 hour). At equator, two full slight spread hands thus indicate two hours to darkness. At higher latitudes, where the sun moves not only “up and down” but also along horizon, you will have to place fingers contiguously below the sun and the horizon, and here each finger would equal ca 20 min to sunset, while your slightly open hand on an outstretched arm would still designate exactly 15 degrees or one hour. At 30 degrees latitude, it would be something in between the two. Most important methods are learning to observe the sun, vegetation, dominant wind direction, learn to use “home-center” navigation and finally speed and time passed. **LEARN TO OBSERVE THE SIGNS IN NATURE, EFFECTS OF SUN, WIND DROUGHT AND HUMIDITY ARE WRITTEN ALL ACROSS THE LANDSCAPE BOTH IN THE NATURAL AND MAN-MADE ENVIRONMENT.**

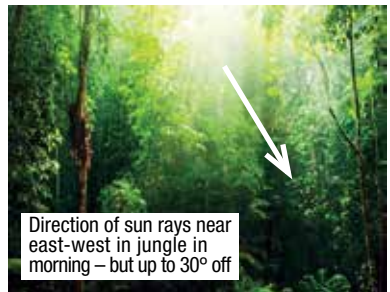
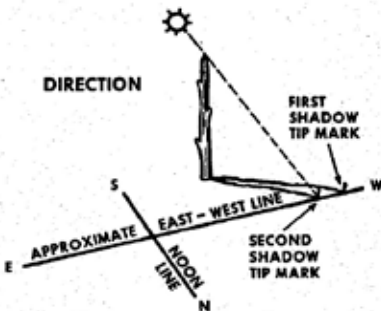
When you travel, try and estimate your speed as best you can. Learn to recognize your own speed in different terrain. In jungle and swamps your speed can go down to a few hundred meter per hour, running in open terrain on a road or trail it will be around 10 km/hour. Typical fast walking is 5-6 km/h, in terrain or forest 1–4 km/h, in the dark or with heavy gear, 1-2 km/h maximum. Remember that if you walk with your nose in map and fixed on a compass your speed declines dramatically, even worse with GPS. Get your bearings, find a fix point, and move steadily on that course, aiming for any natural or man-made feature that can guide you in on course or confirm your route.

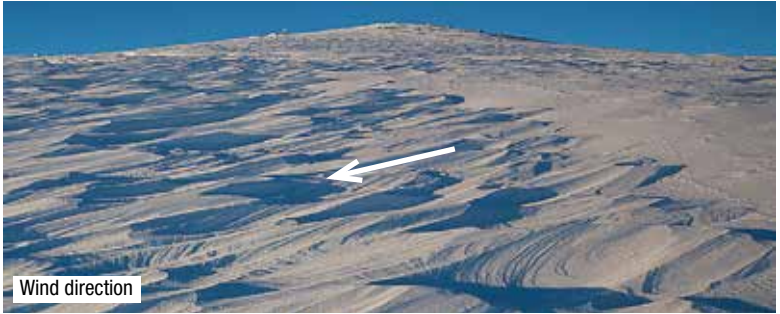
Remember all the numerous natural indicators: The swell in the ocean reflects many previous days of wind, the direction of flow in rivers, the wind in open terrain (if it stops before shifting, you pay strong attention and stop as well), cobwebs in the lee or sideways to the wind, vegetation, faded paint or wood on road signs (reflecting high exposure to sun),

other terrain or man-made elements faded where sun exposure is highest, moisture in soil, warmth in soil (reflected in vegetation composition, in cold climates it results in more willows or cacti on south slopes in northern hemisphere, opposite in the southern hemisphere – here, north slopes are the warmest. In dry landscapes, the slope with the least sun exposure has the richest vegetation due to less water loss. Pools and puddles will dry up faster on the side exposed the most to the sun. Blaze trees on both sides if needed, or cut “open windows” by limbing small trees in a section of crown, or make small pyramids/mounds of rocks, so that you can back-track more easily when searching for routes.

At the equator, the sun is in the sky in zenith (right above you) at true noon, but up to 23.5° off in morning and evening in June or December. In Sept and April – the sun’s movement is obvious: the sun moves nearly directly east-west! Hence, simply by observing the direction of the shadows, they will point east-west, shortest at noon. Furthermore, if you are say $10\text{--}30^\circ$ off equator, the sun will move in a slight arc, and you can easily adjust for this with training to understand the east-west line, visually faster than the old shadow-stick-method – but beware of greater inaccuracy in summer and winter.

OPS: Notice in the illustration below that the shadow-stick method - where you place a rock at the end of the shadow from a stick and a new rock after say 15 min after, at the end of the new shadow – in theory this line from stone to stone will be east-west. This works great at lower latitudes, but can be 95° (!) erroneous at higher latitudes (for example north of 60° latitude early in the morning and evening during summer), while it works fine in spring and autumn anywhere and around noon. Direction of the wind, such as on sand dunes, snowdrifts or on trees, is extremely important in mountain and polar regions in bad weather. If the wind changes – STOP and NOTICE!





Almost all jungles/tropical rainforests are located within 20° north and south. Such environments are hard to navigate in – especially around noon. Sun rays in morning and evening at first/last light and early hours in jungle canopies show the way, pointing east-west, but up to 25° off at highest jungle latitudes. In morning fog, notice birdlife and wildlife that may position themselves on the side of tree tops facing the sun for dry-up. Notice directions of rivers. Be advised that swamps and slope sides should be avoided due to difficulty in travelling and risks, with many thorns (come-a-alongs), bamboo and other impenetrable vegetation with resulting injury and difficulty in estimating your time and speed. Ridges and shallow streams, if any, provide easier travel routes, though often winding. Beware of river crossings and falling branches. Beware crocodiles – you see their slidemarks on the the banks around still water, swamps and slow-moving rivers. They avoid strong currents. Bend and bind small trees together and sleep off-ground, cut vines for water, and blaze trees on both sides for direction. Look for human tracks that can lead to villages.

In urban areas, it is better to use the “home-bearing” principle and count streets and left right if possible, or lights or round-abouts. Notice particular street signs, buildings, or better a part of town with high buildings, a hill or a mast. If you can locate characteristics of the town - almost all cities have certain quarters with their own characteristics – “chinatown”, “italian” quarter, embassy quarter, industrial area, business/financial districts, shopping districts, tourist streets, a major bridge or monument/palace/church/mosque, a harbor, an airport, select one characteristic part of town and use that as your bearing, using also the sun again. Also notice direction of tv-antennae, that will point towards the main TV mast in town, or satellite discs that will point straight south or north, dependent upon whether you are in the southern or northern hemisphere. Easy to estimate distance in towns when walking (ca. 4 km/hour, dependent upon traffic).

15

SURVIVAL

This chapter provides a quick overview of some basic tried and tested survival methods from across the planet. Learn from the locals and have patrols learn and become proficient in local survival skills that can be readily used to make their ordinary patrolling easier. Survival training is not so much about ultimate survival but about obtaining field skills that can be applied to make life easier both on patrols – or in a survival situation, but foremost it greatly increases the skills of the rangers in conducting comfortable long-range patrolling.

Murphy's law: *"Anything that possibly can go wrong, will go wrong"*.

Holger's law: *"Sooner or later it will go wrong anyway"*. Train for coping with situations where SOPs do NOT work, and where you have to rely on yourself without back-up, support, communications, etc.



SURVIVAL FOOD AND WATER FOR LAW AND CONFLICT PERSONNEL

Food

1. Your body normally holds plenty of reserves for evasion. Speed and distance is essential for survival, not food. But be advised that your acute energy reserves (glucose, glycogen) are less than 500 grams and are quickly spent on excessive exercise, while your fat energy reserves are ca. 10x as big – and can be used but only if you move without excessive spending (walking fast and steady rather than sprinting).
2. It is better to pick many small edible plants or insects on your way than to spend many days looking for a full meal. Again speed, stealth and distance are essential for avoiding capture.
3. If you can prioritize, eat mainly protein rich food in the evening in deserts or in cold climates. Avoid protein in the morning or during the day in arid or hot areas, as this will increase your body heat (half of the energy in protein goes to heat) and will increase your water demand. If water is not available, do not eat at all. In hot regions, eat mainly carbohydrates (plants, fruits or rice) and mainly in the evening.
4. With little food, eat mainly in the evening and only "snacks" to ensure your acute energy reserves are as full as possible. Avoid energy exercise bursts. Don't eat in the morning, eat little during the day and eat most at night.
5. Be advised. Most of the water, shelter, wild foods and animals are found in the relatively most undulating and rugged terrain.

Animals

6. If you are far from people, shot can easily be ventured. Butcher game for precious intestines, fat and meat and move quickly far from site. Dry meat in super thin slices by smoking, sun drying or roasting.
7. Eggs: All can be eaten whether partly hatched or not. Look for abundance of rich or plenty of dead grass or vegetation in otherwise rocky terrain to identify bird colonies. Hold egg under water, if it lies flat it is good, if it floats, it is partly hatched, but can be eaten anyway.

Coastal zones – rich in food

8. Kelp and macroalgae: Collect those in water that are fresh, cook or roast on fire. Many can be dried and eaten raw, such as sugar rich examples here. Rinse first if possible.

9. Collect mussels. Take those underwater at low tide. No water needed for cooking. In sand look for bubbles when waves pull back back. Simply roast them or put them in pot on fire. Snails with houses are good and can be roasted. Cones may sting and be deadly poisonous.
10. Crabs can be roasted or cooked in salt water. Most are easily found on steep rocks and at darkest time of night.

Insects

11. Grasshoppers are good, but throw away legs and wings. Don't eat beetles. Larvae great, but not caterpillar larvae.
12. Ants are among the easiest and best-tasting. Simply collect, crush them and eat them raw. Anthills are predominant in southwest facing slopes in the northern hemisphere. Watch for snakes in tropics in ant-(termite) hills. Crush anthill on tarp with twigs as shadows on the sides and ants will carry all eggs to the shadow for you. All insects are edible, crush them and suck them.
13. Larvae are found in the bark and roots of trees. Look for fine dust and tiny holes indicating presence. Eat them raw. All snakes are edible but never grab by hand. Use long forked stick, chop head off, clean and roast on fire. Avoid aggressive species.
14. Careful with amphibians and reptiles unless known as some are poisonous.

Vegetation – easiest source of food next to coasts

15. Nettles are found across the world, typically around or near people/abandoned buildings/barns and nutrient rich sites. Roots and leaves are good for soup or can be crushed and eaten raw. Nettle fruits, even when apparently dry and “ugly”, are rich in oil and are tasty and nutritious.
16. Dandelion is common. Put roots in water for a while, cook them or eat leaves raw.
17. Thistles have roots with high amounts of carbohydrates. If possible soak in water for a while before eating it.
18. Fireweed, roots are rich in carbohydrates but very sour. Soak a long while before eating. Leaves and flowers are edible raw and can be used for tea.
19. Grasses and graminoids: All are edible! Most roots or stems are rich in carbohydrates. Many flowers are rich in protein in early stages of growth, *Eriophorum* sp. is very tasty indeed.
20. Lichens: *Umbilicaria* sp. can be eaten raw. Other should preferentially be soaked in ash and water solution and then boiled.
21. Pine, fir and spruce needles can be boiled for Vitamin C rich tea. So can blueberry and raspberry leaves. Berries are excellent food when available.

22. Bamboo shoots can be cooked. If you have rice, cut a thick piece of green bamboo (2–4") below two joints, fill 1/3 with rice, fill it up with water and place leaf as lid. Place in fire and cook, then split (see photos).

Urban food sources

23. Look for waste bins near restaurants ("McDonalds") or market waste areas, prioritize food with carbohydrates (french fries, nam-bread, kebab) or freshly dropped food waste as much food turns bad quickly. About 50% of all food is thrown away.
24. Look for fruit around markets where bad fruit is sorted away or thrown away. Use water bottles for collecting rainwater. In the tropics you will find plenty of rainwater collectors on roofs.
25. Numerous small fields and gardens in outskirts or on roof tops. Livestock (chickens, dogs, etc.) common in streets in slum areas. Better to scavenge garbage than steal as it will bring unwanted attention to you. Broken glass inserted in potato good weapon or pick stone from common rubble.
26. In tropics, small banana plantations are found near people, along rivers or in home gardens, but also in jungle fields along with corn. If remote, you can cut tree and hollow stump, water will gather quickly.

Water

1. Clear small springs with drinkable water are found all over the world, also in rainforests.
2. In jungle, cut 2 m stick from vines up to thickness of arm as it is full of water. If reddish or feel acid on tongue, do not drink, You can bend vines, cut them and carry them with water in them. Do not drink water from still ponds/swamps in tropical areas unless unavoidable.
3. Tie clothes around legs and walk in dew-laden grass to collect water. Make funnels of big leaves to gather and funnel rainwater. If you have to dig in river beds, do so where there is mud or lush vegetation in bends and shadow.
4. Melt snow by putting it in tarp and hang near fire if no pot. Frozen sea ice, especially old, contains fresh water on the top.
5. In Africa, learn to find tubers on roots as they contain a lot of water. Learn to use a digging stick. Cut a branch/tree around ½–1" diameter and 3 feet long and use it to dig.
6. If you have two bottles, you can distill salt water and urine by taping bottles together and leave the one with fluid in sun, the other in sand, where the shade/cooling effect will cause the water to condensate. Only attempt a solar still if you have time (stranded),

vegetation to fill in or water to distill. Learn to find tubers in desert if in Africa, and distill water from cacti. Many have acid/stomach hurting liquid if not distilled.

7. Coconut palms are widespread in the tropics. For coconuts, shake “dead” brown coconuts in hairy shells lying on the ground below coconut palms for food. For drinking, cut down orange coconut shells from palm trees, and sever top. They contain a lot water. Open with knife or place stick or sharp rock in sand to open. Sprouts from nuts on the ground can be eaten like salad.

Urban

8. There are rain water collectors on roof tops or in barrels. Also look for irrigation systems, as well as for water in churchyards.
9. Watch for barbed wire and glass on walls! Look for hills around and drainages on outskirts if there are small clean creeks following rainfall. Beware of water quality in streams downstream from livestock and people!

Fire

1. You can build fires for food or warmth if you move far from enemies and travel long distances. Preferentially use small dry twigs that generate no smoke and keep fires short in duration, minimal in size, or use dakota hole.
2. Always place stone or logs to create funnel in wind direction with both ends open. Never make “wall” or ring around fire as it will generate smoke and make the wood harder to burn if wet. If wet, look for dry oil-smelling wood species (pine roots/stumps, juniper, or oil-smelling desert plants).
3. If hypothermia is a risk, build a fire of three parallel logs, and a wall/tarp of twigs and branches to your back.

Camping/sleeping

1. Look for remote parts of un-guarded parks/woodlots for sleeping in urban areas and rise EARLY. Elsewhere in rural areas find rugged undulating terrain, never singular hills, high singular points or conspicuous wood lots. Always fish-hook into a LUP and place it in rugged terrain with multiple exits. One direction fairly open, but 10-50 m inside vegetation. In heavy rains, big canopies provide best cover near trunk. Never eat or cook in LUP.
2. If building a bivouac, take care not to leave too much sign when cutting branches



Preparing bamboo



Cooking rice in bamboo



Serving rice

and hide both bivouac and cutting sites carefully. Cut stumps are seen from a far, so is trampled vegetation. Place both cutting sites and stumps away from natural travelling routes and place bivouac carefully under natural canopy by thickening canopy at base. Do not construct a solitary open bivouac.

3. If cold, camp inside ant hills or make tight dense shelter and thick mat of spruce branches. Fill clothes with grass, make log fire or sleep in hollowed-out anthills.
4. In tropical environments look out for flash-flood sites. Never camp near rivers or in gullies in deserts or jungle.
5. Make A-frame by tying smaller trees together by bending them, attach 3 poles, one in top, two on the side and make bed at 1–3' height. Cover top pole with banana leaves or similar to water proof. Least insects in areas away from water and in areas with little sunlight and vegetation far below canopies. Never sleep on the ground in the jungle. Look out for risk of falling branches.



Patrol planning requires full attention – and good humour.

This manual, a complement to *Tracking: A blueprint for learning how* by Jack Kearney (US Border Patrol), is intended to provide law enforcement officers and national park rangers with an additional tool in learning how to track poachers, criminals, or lost subjects; to gather intelligence on criminal activity; and to improve crime scene management. It is further intended to provide them with a tool set necessary for securing evidence for prosecution.

