

Tracking and Law Enforcement

The Science of Visual Tracking



30 – 40% of cases in some countries are solved using foot impression evidence compared to 3-5% in the US (William Bodziak)

This is due to the lack of training in the importance of tracking, foot impression evidence and aggressive searching techniques

Some forensic examiners refer to foot impression evidence as “The Missed Evidence”.

(Dwayne S. Hilderbrand)

Hull's Tracking School

hullstrackingschool.com

David Michael Hull

434 996 3639

mikehullvitale@gmail.com

Instructor

Cell

Email

Instructor

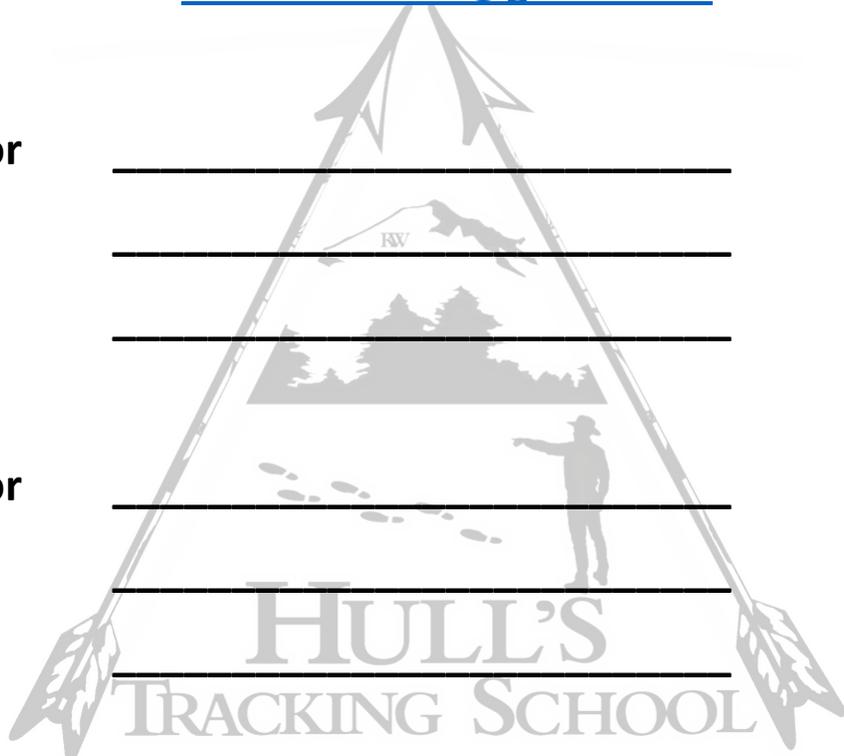
Cell

Email

Instructor

Cell

Email



Special thanks go out to Rob Speiden, Kyt Walkin and Bob Brady
for reviewing this work and offering suggestions.

Contents

How Tracking can Enhance Investigations in Law Enforcement	4
Types of Tracking Disciplines.....	6
Optimizing and processing visual perceptions	8
What makes things visible	9
Elements of Visual Perception	10
Basic precepts of track analysis.....	12
Identifying Key sign.....	16
Ageing Tracks.....	20
Things that effect the age	20
Tactics for Ageing Tracks.....	20
Preserving Foot Impression Evidence	21
Photograph It.....	21
Dental Stone Casts.....	21
Electrostatic Dust Lifter.....	22
Tips on how to relocate the track	22
Back Tracking.....	24
Tracking at Night.....	25
Other Tactics for Tracking	25
Index.....	28

Except as permitted under U.S. Copyright Law, no part of this manual may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publisher.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks and are used only for identification and explanation without intent to infringe.

© Mike Hull April 2020

How Tracking can Enhance Investigations in Law Enforcement

AVOID CONTAMINATION by understanding the value of foot impression evidence officers learn to be more cautious and observant as they move around a crime scene.

Conclusive evidence Like DNA and fingerprints, foot impression evidence can be just as conclusive with unique identifiable features that cannot be contradicted.

The Lack of Tracks is evidence in itself I cannot count the number of cases resolved because the lack of tracks allowed me to conclude that it didn't happen to begin with.

The lack of tracks, other than the suspects, also provided conclusive evidence there was not a second person alleged to be the shooter.

The lack of tracks going up the side walk (in the snow) showed the suspects were avoiding detection and by detecting foot prints moving through the woods, to the corner of the house then around to the front door was consistent with a tactical planned attack.

Establish time frames by learning to age tracks it is possible to establish time frames as to when something occurred or when someone was present.

Reconstruct the crime scene by assessing the totality of footprint evidence It may be possible to totally reconstruct the crime scene and provide conclusive evidence to determine who did what. Such as, who was the lookout? who committed the crime? Etc.

Extend the crime scene by identifying the footprint evidence at the initial scene, trackers working the scene can identify ingress and egress of suspect tracks and can expand the scene as trackers follow the track evidence away from the initial scene, potentially finding and preserving additional evidence.

(continued)

Detect number of persons involved detection of footprints allows you to establish the number of persons involved,

Focus search in the most likely area when searching for people the most likely evidence you will find are tracks. A single person can leave over 2000 opportunities in a mile. If you find one track you reduced the search area in half, a line of sign reduces the search area to a quarter or eighth. Knowing how to track allows known tactics to be applied to speed up the search for missing persons and fugitives.

Officer safety/Evidence of someone's presence tracking provides details and additional information that will make the officer more aware of their surroundings. Identifying tracks alerts the officer to the presence of others in the area as well as frequency.

Develop suspects on the scene the basic examination of foot impression evidence (size, type, and pattern) can be done at the scene by the officer for such detail as size, type, pattern, wear characteristics and unique characteristics. This information can be used immediately to develop suspects. Unlike DNA and fingerprints that must be sent to the lab. (conclusive examination of foot impression must be done at a forensic lab)

Ability to operate undetected in rural environments learn to track and you learn how to anti track. You learn what mediums leave more sign than others. How to move about with minimal disturbance eluding to human sign. Very useful for surveillance, snipers, placing remote cameras and to recon an area.

Types of Tracking Disciplines

There are many uses of tracking therefore different techniques, equipment and formations are used for specialized results. But the bottom line is the basics of interpreting disturbances on the ground are the same. I have listed many interesting uses of tracking below.

Animal Tracking no matter what your interest in tracking is, you must be familiar with the animals, (both wild and domestic) in your area of operation and what kinds of disturbance they make. You will always be dealing with contamination by both humans and animals so you must be able to distinguish human sign from animal sign. Knowing animals' habits can also assist you with aging tracks.

Search and Rescue Tracking humans is more common in search and rescue and trackers are one of the first resources requested. Virginia has a dedicated volunteer group called SARTI - Search and Rescue Tracking Institute that is composed of highly trained and dedicated trackers. Their website is www.sarti.us. They conduct quarterly trainings around the Commonwealth of Virginia and welcome new members regardless of experience

Tactical Tracking Tactical Tracking is used to pursue armed and dangerous persons in rural areas. This method has been adopted from the highly successful Selous Scouts of South Africa.

Anti-Tracking Anti-Tracking / counter tracking is to move about without leaving sign that can be related to humans. This ability benefits snipers, SERE training, surveillance operations. Learn to track and you learn how not to leave sign.

(continued)

Elimination Tracking By cutting for sign along track traps you rule out areas people didn't go thereby you narrow the search area. Also, I cannot count the number of instances where the entire incident was reversed (eliminated) because the lack of tracks proved it didn't happen. Elimination also refers to techniques to distinguish contaminating tracks from the subject of interests tracks.

Intelligence Gathering Tracking is a great way to recon an area you may be operating in in the future to see what kind of use it is getting from both humans and animals. Also, useful to determine how often and how many persons have been using an area, their ingress and egress.

Forensics Tracking Collection, preservation and reconstructing track evidence. How to document and preserve foot impression evidence and reconstruct an individual's movement around a scene.

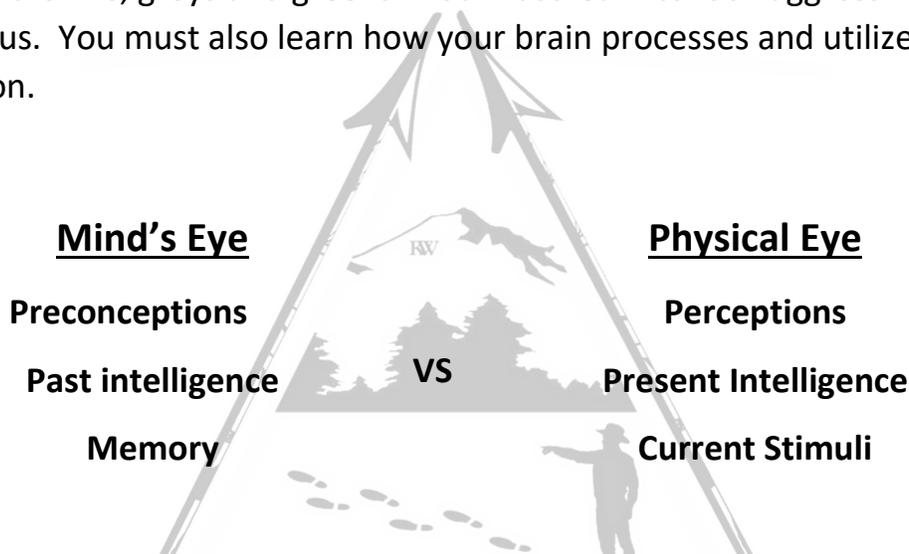
Detection of IED's Improvised Explosive Devices are a major threat to our military. 80% of IED's are found by visual acuity, not technology. Teaching Bomb Tec's how to identify human activity and traits when targeting persons with IEDs and ground disturbance.

Integrating Trackers and K-9s Trackers and K-9s can work together and the two resources complement each other. A canine handler who learns to track learns to use the canine more proficiently and how to set the canine up for success.

Wildlife conservation and Antipoaching It combines animal tracking with Tactical in order to monitor the fauna and detect any illegal infiltration of poachers inside Parks and Reserves.

Optimizing and processing visual perceptions

Learning to track will encourage you to relearn to see. To look at detail and see beyond the most obvious. Society has accommodated you so much to make things simpler and easier that it has weakened some of our most basic senses. Our vision has been spoiled with society's contrasting colors, distinct edges and bright flashy colors. Black letters on white paper, street signs and road markings, advertisements etc. "society's sign" jumps out at you with proper lighting, sharp edges, movement and contrasting colors. In nature, sign is muted with different shades of browns, greys and greens. You must learn to look aggressively and past the obvious. You must also learn how your brain processes and utilizes visual stimulation.



The **mind's eye** allows you to visualize your **past experiences**. With those experiences you analyze current stimuli and process its value in accordance with previous experiences and knowledge learned. You should forever consider previous knowledge but realize it is limited so as not to form absolute ideas when processing information in an ever-changing environment and therefore allow expansion of the subject matter at hand using sound deductive reasoning based on facts. Keep an open mind!

The **physical eye** deals with the **PRESENT STIMULI** observed which is then processed with the mind's eye. Intel should be gathered by what you see, not from what you want to see. Structured training in identifying and analyzing disturbances in the natural environment builds knowledge and confidence to properly examine the ground.

Summary:

Trackers must always be conscious if they are being motivated by visual perception from the physical eye which is new evidence, or preconceptions they want to see initiated from past experiences. Preconceptions causes the observer to try and force indicators to fit their idea, overlooking other sign.

Keep your eyes moving while processing the ground for disturbances then analyze those disturbances with the mind's eye, if you find yourself staring beware your mind's eye will naturally take over and you may begin to subconsciously start forcing what you want to see on the ground. This is commonly referred to as ghost spoor. You are no longer looking for disturbances in the natural environment to analyze, instead you try to force what you want to see onto the ground. Time to take a break!

What makes things visible

Light

The physical eye cannot operate without light. Understanding how to use light wisely and how to manipulate it to your advantage is one of, if not the most important, tactic for a tracker to learn.

Amount: Too much light at the wrong angle will result in a shine that washes out detail

Too little light and detail is not visible

Angle : An overhead light shining from a 90-degree angle will seldom produce shadows which are needed to assist in the discovery of edges of objects. (ex: the sun in the middle of the day, the ceiling light in a building)

An oblique light, a light at 30-degrees or less from the surface, will highlight edges and reveal detail more prominently.

Direction: The direction the light is coming from may reveal or conceal the visible information left on the surface. If you are holding a light in your hand and pointing it away from you, or have a light attached to your head

(IR on night vision included) or the light source is behind you, then you will not see shadowing. Shadowing reveals edges and depth of objects.

If you have the tracking area of interest between you and the light source, in most situations you create the maximum advantage of the light to reveal detail.

Summary: When tracking on any medium, anywhere and at any time, your first concern should be your available light sources and how you can manipulate them to your advantage.

Turn off overhead lights in a building when looking for tracks, use a flashlight to manipulate light angle and direction

The middle of the day is the worst time to track due to the sun's position, best time is morning and evening

Tracking in shaded areas such as under trees or other canopies may be enhanced by using a flashlight or reflecting the sun into the area with a mirror.

Exception: If tracking through grass, the light at your back is better positioning to reveal shine

Elements of Visual Perception

While proper light is needed to separate and distinguish an object from its surrounding the following elements are what really distinguishes one object from another. It could be one of these elements or a combination that makes an object visible. Learn these seven things, memorize and use them routinely when searching for visual evidence until it becomes second nature.

The **outline** also referred to as the edge of an object is a distinguishing difference between two forms. An outline may not be the complete object. It could be revealed by a difference of such things as color, value, texture, depth, shadow or moisture content.

The **shape** of an object will reveal a familiar pattern. A shape is a complete or partial outline, which reveals a basic known object such as a foot, heel, shoe or geometric tread design.

The **color** of an object distinguishes it from another because it reflects or absorbs light differently. Some common occurrences you will find on the ground that changes color are moisture differences, different soil types exposed, the sun's UV rays bleaching the surface of all things making them lighter.

The **value** of an object results from the amount and angle of light projected upon it. Value exhibits the degree of lightness and darkness. The object does not change color at all but reflects light differently due to the arrangement of the object to the light source causing a brighter side in direct light because it reflects more light (shine) or a darker appearance referred to as shadow due to less light being visible.

Take the tall grass in a field, for example. Walk into the field and make a wide U-turn, coming out next to your entrance point. Then observe each disturbance from a short distance. You'll notice that where you went into the field, the grass appears lighter because it is bent away from you and the long stems reflect more light back towards you. (continued)

Where you came out of the field, the grass will appear darker because you will be peering into the ends of the grass bent towards you and into the shadowed areas of the long stems that are reflecting the light away from you and block the light. The grass has not changed colors at all; it is simply reflecting light differently, showing different value. This is the same effect you get when vacuuming a carpet. It lightens when you push away and darkens when you pull the vacuum towards you.

Texture is a varying form of roughness or smoothness. Texture changes occur when something is mashed, rubbed, transferred or damaged in some manner. A change in texture will usually reflect light differently, simply because the surface has been changed. A flat surface will reflect more light and a rough surface less. Texture changes can occur in all types of media. Human tracks leave large flattened areas in most situations causing the surface to reflect more light than the surrounding area and creating a shine.

Rhythm can be identified as a consistent pattern or application of geometric shapes — circles, diamonds, squares, swirls, right angles and

bars, all of which are found repeatedly in a shoe's outer soles. This sequence of perfection is not often found in nature.

Rhythm can also refer to the sequence and amount of disturbance shown in the stride or gait where someone has passed.

Movement is an act, which readily distinguishes one object from another. Some common movements observed while tracking are bushes moving, grass in the process of standing back up after being stepped on, plants weeping sap due to bruising, water filling in the track that was depressed into the ground, insects scrambling about that have been disturbed.

The goal of most trackers is to find your quarry. The one thing that readily attracts the eye is a moving object. The only thing better than finding that next track is finding the tracklayer. You should always look up often for the quarry and it helps to relieve eye stress

Basic precepts of track analysis

For every action, there is an equal but opposite reaction.

The primary impact point, foot roll and termination point are prime examples of this law of physics. By identifying the resulting marks left on the ground from a track and analyzing them you are considering size, weight, shape and force to determine such things as the identification, direction and distance of an individual step.

Rhythm and balance

Rhythm is movement or procedure with uniform recurrence, Balance is to be proportionate to. When a person moves from one place to another under normal circumstances the sign left on the ground by the feet or outer soles of the shoes is generally consistent throughout the track line. Meaning there is minimal change in the stride, the pitch of the feet, and the straddle or trail width remains the same. The trail has rhythm and balance.

(continued)

Once an individual slows down, speeds up, dwells. Stumbles, becomes injured or distracted from their goal the arrangement of their foot falls will change indicating their goal and movement has been disrupted. Their rhythm and balance changes. This change in movement should be noticed and assessed as to its significance when analyzing a track line.

Primary Impact Point

When a person moves from one place to another, the typical human gait is for the heel to be the first part of the foot to touch the ground. This is the result of extending the leg forward from momentum and weight after the last step. The resulting force of the heel striking the surface would be the primary impact point. The visual result of this action to any forgiving medium stepped on would be for the heel to force any medium on the surface down into the track floor at an angle due to the forward momentum and weight.

Foot Roll

When people walk the foot does not stamp the ground straight up and down as if marching in place. The foot strikes the ground from an angle, normally with the heel, the foot then rolls across the ground on the axis of the ankle and the ball and toes of the foot are the last part of the foot to touch the ground. The foot rolls on the ground helping the body absorb the weight and force from the forward momentum and assists in propelling the body forward. In a soft medium the floor of a track is not flat but rounded due to the rotating of the foot and pressure from the initial impact and termination points.

Termination Point

The termination point is where the foot last touched the ground. This point is normally lower than the foot roll and below the surface of the medium because of the weight of the person and the force applied to propel them forward concentrated in the ball/toe area of the foot. Which in turn causes the toe to break through the track wall through the medium when lifting it upwards and forward. This action scatters the disturbed medium onto the surface and in the direction to where that foot is to be put down next. This redistributed medium onto the surface is referred to as a plume or toe kick. The termination point may readily reveal the direction of travel.

Pitch Angle

Pitch angle refers to the angle the foot is pointed in relation to the direction of travel in a track line. Three major examples are: Straight forward, pigeon toed (toes pointed inward), splay footed (toes pointed outwards). The normal pitch of a person's trail can be determined by following it some distance. The pitch angle will change with a person as they speed up or slow down, running is different than walking with the same person. Not all persons have symmetrical pitches. Old or new injuries can alter the pitch of an individual foot. Twisting the upper body, speed or carrying weight can also affect the pitch of the feet when moving

Stride

In tracking, stride is referring to step length. Stride on people is measured from the heel of one foot to the heel of the opposite foot. The average adult stride is thirty inches. A person's stride will change when going up hill (shorter) and going down hill (longer). Stride will also change randomly on uneven ground or maneuvering through rough terrain. Stride does not indicate the height of a person but does elude to the health of a person. Short strides are consistent with slow movement, longer strides are consistent with faster movement.

Straddle

Straddle is the measurable distance between the innermost part of opposite feet in a track line. Often straddle can be a negative measurement.

Straddle is mentioned in almost all human tracking classes, but I must confess I have never benefitted by this knowledge while working a track line. Instead of straddle I have found Trail Width much easier and more beneficial to deduce the same information as straddle.

Trail Width

Trail width is the measurement from the outermost part of the left foot to the outermost part of the right foot in a track line.

When the trail width narrows, it is consistent with speed or carrying weight on your back. If the trail width widens, it would be consistent with slower movement than normal or carrying large heavy object up front that is constricting legs from extending forward normally. In tall grass the trail width is very noticeable and is usually around twelve inches for people. Anything wider I would suspect more than one-person, multiple trips along the same path or dwell time. Straddle or Trail Width also can reflect a person's health. Obese people tend to waddle, which is reflected in a typical outward pitch and wide straddle or trail width. Healthier people tend to step closer to the centerline of the sign line. Runners will often overlap the centerline.

(continued)

Dwell Time

Dwell time is when travel stops. It may just be a second or overnight, but the rhythm and balance are affected, the trail width widens at that point, the ground is more disturbed. A pause will usually show both feet side by side. Dwell time will usually reveal time spent in an area such as waiting, resting, eating, or other activity etc. May provide an opportunity to acquire additional information about the person your following or equipment they have.

Summary

To analyze tracks the tracker must be able to identify disturbances in a natural environment. They should then determine if the disturbances are made by man or animal or an act of nature.

In processing human sign, the basic elements for analyzing as Listed and personal experience will assist with making an accurate determination as to what occurred. The key is to not decide by any single element observed but to assess the entire area in question and how each piece of information provided secures your conclusion of any theory you might determine.

Following is an example: When someone walks backwards, they must look over their shoulder to see where they are going, or they just blindly take steps backwards. Either way their rhythm and balance will be off because walking backwards is not normal and stepping back is awkward. With your balance off your trail width will be wider and your steps will be shorter to better assist your balance. Your primary impact point will be your toe and your termination point will become your heel. Your heel will lift a plume (of the medium your walking on) from the wall of the track upon to the surface and spread in the direction that the foot went. So, in analyzing a person walking backwards there are multiple precepts of track analysis that support each other for a correct conclusion, they consist of being off balance your trail width will be wider, shorter stride, primary impact point reversed, and termination point reversed.

Identifying Key sign

The type of disturbance you are most likely to observe in each environment/medium.

Tall grass Tall grasses will usually leave a shine or blaze about twelve inches in width when people pass through it. The big feet of people mash the grass in the direction they travel and the long stems lying flatter to the ground. The surrounding grass reflects more light causing it to shine when you look at the disturbance going away from you from a distance. If the trail is coming towards you it will look darker than the surrounding area since you are looking into the ends of the downed grass and seeing the shaded area. This is a good example of **value change**. The grass does not change color, it is reflecting light differently.

Short Grass Short grass may also show shine especially if the tracker walks horizontal from the suspected direction of travel to utilize the light source from different angles to observe possible track lines. Foot depressions may be observed in the grass and creases in the blades of grass are often observable. Depending on the thickness of the grass you may observe flattening in the soil, geometric shapes consistent with the quarries outer sole or texture changes in the ground's surface

Leaves A line of Color change, texture change, depressions, leaf creases. As leaves fall and the wind and rain sift them together on the ground, they become somewhat flattened out. Then the sun's UV rays starts bleaching out those portions exposed to the surface. The wind also dries the surface. When a person walks across leaves the weight of the foot fall mashes them down and the edges around the feet raise up, toe kicks and foot drags also flip leaves over in the direction of travel exposing moisture which makes things darker. The underside of the leaf that hasn't been bleached by the sun is also darker than those on the surface. To verify this disturbance is human the trail width should be twelve inches. You should be able to find depressions the size of a human foot and within these depressions a critical eye may find leaf creases, objects such as nuts, sticks or rocks mashed into the ground, freshly broken sticks, etc. Careful removal of the leaves may even reveal the heel or full outline of the outsole in the soil underneath.

Pine needles Toe kicks (teepees) , needles on the surface aligned in one direction, fresh breaks in small limbs Pine needles can be very tough to track on. Think of pine needles falling randomly with gravity, wind and rain constantly shifting them to flatten on the ground. As they age, they start off green, then reddish brown then grey. When walking through a bed of pine needles the foot will depress the needles and the termination point will likely drag needles up to the surface creating a toe drag. I call a tepee since it appears as if a bunch of miniature logs have been lifted up forming the frame work of a Tepee. You may also notice along the floor of the track most of the fresh needles now run parallel to the track since the forward momentum has influenced their new arrangement. Another subtle observation I have made in pine needles is the new reddish needles blanketing the surface have been shifted showing more grey needles underneath in a rhythm consistent with a person walking. Pines also have lots of small brittle limbs that are shed regularly. Finding fresh breaks where the foot steps in the middle and the limb breaks on each side, the width of the shoe, is always a good find to “charge your battery”.

Rocks Rocks and gravel may reveal the passage of people in many ways. If the ground is soft the rock may be pushed into the ground due to the weight forced upon it. If not forced into the ground but small enough to move from the weight of a person, the rock may rock back and forth during the foot roll creating a slight crevice along its edges. Rocks may also be accidentally kicked out of the ground during the mid-step as the foot swings forward leaving a pock mark and a rock on the surface in the direction of travel that will likely have a darker surface on one side due to moisture where it was in the ground or bleaching from the sun on the side that was exposed to the surface.

Vegetation It helps to have a good knowledge of the various vegetation in an area of operation since they all react in different ways when damaged. Some leak sap in damaged areas and some vegetation will wilt almost immediately while some will spring right back up. Mashed and creased areas usually change color. All vegetation wants its own piece of sun light, so they naturally compete for spacing. Once stepped on this natural spacing is disrupted, mashed and mangled, flattened. All leaves have a waxier coating on their upper surface to protect them from the sunlight, the under sides are lighter in color. If they are

damaged from someone passing through the underside may be more exposed revealing the lighter side and this is referred to as flagging to the tracker.

Streams Slow moving streams will have silt on the bottom and on the rocks. When stepped on the silt is removed and washed away revealing a clearer view of the rocks surface. Walking in a stream may result in a line of sign where silt has been removed or on individual rocks resulting from rock hopping. Foot depressions may also be observable on the floor of the stream if it has a muddy bottom.

Frozen Ground Ground freezes because it has moisture in it. The moisture freezes to ice and binds the substrate in the medium together. This freezing occurs differently according to circumstances beyond my knowledge, but our mission is to learn to deal with it.

Let's start with frost, that is quite simple since the ice is like a fine snow covering the surface of the ground and usually a weather report will reveal when the frost will form. This information gives you an edge on aging when an incident occurred. Before or after the frost! Tracks are easy to follow on the frost but becomes more of a challenge once it melts.

Needle ice freezes into an upward direction like stalagmites in a cave. This action lifts small soil particles and debris slightly upward with it and when stepped on flattens out leaving a depression identified by shape, shine, texture change, rhythm etc.

Frozen ground can be tuff due to the need for a more aggressive observation for minute particles of ice and soil crushed or flattened.

Frozen ground can be very tricky tracking because you must determine an approximate time the incident occurred to know exactly what you need to be looking for. For example: if the incident occurred at four am when the ground was frozen hard, and you arrive on scene at 10 am after the sun has warmed the surface. You cannot index your track to determine what to expect to find when looking for the suspect's tracks because the conditions have changed dramatically.

Snow There can be a lot of different variables to deal with when tracking in snow. Snow can be a fine dry powdery snow, a wet snow, sleet, or anything in-between. Outer sole impression detail can range from microscopic detail available to the inability to determine outer sole properties at all. Depending on conditions tracks can be erased in seconds or remain for weeks due to the type of snow, wind and temperature fluctuations.

A few tips on acquiring information when processing scenes or tracking in snow:

- When you step on snow (not ice) that gives under foot, the compressed snow creates moisture that collects on the floor of the track. If you can push your finger into the floor of the track and there is not a layer of ice to break through the track is probably fresh. If the weather is below freezing the moisture will freeze very soon. If the temperature was freezing during the night but warmed above freezing at daybreak and you find a track of interest, if there is no ice on the track floor logic should tell you it happened early morning. If the floor of the track was frozen then you know the track was made earlier in the night and had time to freeze before the weather warmed.
- Knowing how the track floor freezes allows other options in finding tracks. If your looking to find egress or ingress to a scene that occurred during a snow and prior to your arrival the tracks have been covered up due to powdery snow shifting by the wind, there are a couple options you may try. That packed and possibly iced area where the track was made may possibly be exposed with a leaf blower removing all the undisturbed powder snow around it. On a deck you could possibly lightly sweep the deck and expose the footprints. You may have seen the sun melt the snow on a deck before and only the tracks remained where someone had walked due to the compression creating moisture that froze creating a more solid form. A light sweeping with a broom removes the lighter snow will leave the more solid evidence of a persons movement.
- In deep snow where tracks have been covered with fresh snow, I have heard you can take something like a boat paddle and slice the snow and feel the iced footprint when you get to it with the edge of the paddle. Not something you would do for a long way but it would be worthwhile to establish a direction to initiate a search.

Ageing Tracks

Rarely should you age a track by only one track. You should view a track line where different mediums have been disturbed in various locations in order to get as much information available to make an accurate determination.

Things that effect the age of a track.

- Location of the tracks are they exposed or are they in a protected area.
- Moisture rain, fog, dew, snow, ice, humidity
- Temperature freezing, thawing, Hot - Humid or dry
- Soil type sandy soils erode fast, clay soils hold tracks the longest
- Wind speeds up erosion, dries the ground quicker
- Sun exposure dries the ground quicker, UV rays deteriorate
- Time of Year Important when assessing damage to plants

Tactics for Ageing Tracks

- **What has the weather been like in the area?** Before, during and after.
- **What was happening when the tracks were made** (weather wise)
- **What has happened since the tracks were made.** (weather and animal disturbance)
- **Indexing** make a fresh track next to the track in question, observe and use tactile methods to determine the following contrasts between the two. The more the contrast the older the track.
- Hard/Soft, Rough/Smooth, Wet/Dry, Warm/Cool, Sticky/Nonsticky, Resistant/Nonresistant

Preserving Foot Impression Evidence

Lockard's Exchange Principle

"Where, ever you go, whatever you do, you take something with you, and you leave something behind".

Protect It from Destruction, it is usually the first thing to get destroyed. Use your vehicle, acquire a canopy, chair, table, bucket, tarp, use markers etc.

If POSSIBLE, RETAIN THE ACTUAL OBJECT THE IMPRESSION IS ON AND SEND IT TO THE FORENSIC LAB

Photograph It

General Photographs and ID markers showing how it is related to the overall scene.

Take Examination Quality Photos using same ID marker for each piece of evidence in the general photos

Take photos from an upper perpendicular position (90% angle) using oblique light

Take at least three pictures using oblique light from a different radius around the track

Take with a Scale placed at same depth as the floor of the track

Focus on the Detail of the Evidence not the scale

Control existing light source

Photograph in Natural State Before Enhancing

Dental Stone Casts

Dental Stone Casts retain microscopic evidence and provide more detail for comparison than photographs.

Dental stone can be used on dry ground, snow and under water.

Do not clean the casts

Broken or partial cast are still valuable

Electrostatic Dust Lifter

An electrostatic dust lifter is used for two dimensional tracks on Floors, Carpets, Decks, doors, vehicles, tables etc;

If your department does not have an electrostatic dust lifter get one, or at least find an adjoining agency who has one you may borrow when needed and learn how to use one.

When seizing footwear or other objects for comparison examination, protect any foreign matter or soil that may be attached.

Quick recovery of impression source is important to prevent wear and alteration of individual characteristics.

Tips on how to relocate the track

When following a track line, it is important not to go beyond the last known track unless you have developed a systematic approach. Two of the most common reasons for losing the trail is a sharp turn has been made or a change in the medium. From the last known track, you should observe outwards for both ground spoor and aerial spoor. If sign is observed, you inspect it to see if it was made by the quarry and return directly along the same route if the sign is not from the quarry. You should also micro track, look for the next couple tracks after the last known track. Just one or two more tracks helps to establish direction. If nothing of interest is observed, then you start lost spoor procedures.

1. From the last known track, observe paths of least resistance. Proceed along these paths looking for spoor for a comfortable distance. If no spoor is found return the same route and choose another path for the same distance. Continue until all possible routes are analyzed. If no spoor was found, then the next procedure should be utilized.

2. From the last known track, go back on the track line the same distance as you went forward on your first procedure. This should leave the last known track in the middle of your procedures. Now circle around the last known track and keep on the outside of the area you searched during the paths of least resistance.

You back track from the last known before starting the circle in case the quarry has turned sharply back on its path. You can do a wider circle after the first one.

3. Use terrain features to box around the last known track and the area you may have contaminated when implementing one and two. The type of features you choose as boundaries to box around should be areas where tracks would be easy to find, known as track traps, such as; The side of a bank or steep hill instead of flat ground, edge of a lush vegetation, a dirt road, a fence line, a creek bank.

4. Although I have listed a systematic sequence, terrain and experience will prompt you at times to skip the sequence and jump to the most appropriate procedure such as listed below:

- If you lose the track at the edge of an open field and there are no paths of least resistance you might want to do a wedge cut. Imagine the quarry's trail going straight, then enter the open area at a 45 degree from the projected track line for about 30 yards. Now cross over the projected track line looking for tracks, then back to the last known track thereby forming a wedge.
- If you lose the track at the edge of a small open area or vegetation change you may choose to go straight to a box cut and go along the edges of the open area to see where they left it. The same goes to hard ground or large rocky areas. This is also useful to pick up tracks of suspects at a contaminated crime scene by going around the outside it may be possible to find ingress or egress.
- If the trail of the quarry enters hard ground such as a well-worn trail or hard surfaced road you must follow the trail or road with hopes of finding where they left it.

(continued)

- By determining size , type and pattern of the quarries outer sole at first opportunity, you can share this information with others and have them leap ahead of the quarries trail to known track traps to see if they have passed through that area and you can post overlook at known directions of travel.
- If you arrive on scene and there are no witnesses and the scene is contaminated then you must circle or box search outside of the contaminated area in search for tracks leaving the scene that are consistent in age with the incident.

Back Tracking

- Back tracking is a passive track used to gather intelligence.
- Where did the quarry come from?
- It is possible the incident was a target of opportunity. If so, tracks were not hidden on the approach but consideration of concealing them occurred after the act.
- Possible to detect clearer/fuller detail of the outer soles from mediums stepped on, on the back track.
- Possibly find a cache of “tools of the trade”.
- Once a criminal is captured the backtrack has proved in the past to recover the weapon used and discover other evidence linked to the crime
- The back track has produced evidence to document that the suspects actions proved he was of a sound mind and body by using known evading techniques, discarding everything related to the crime scene, documenting physical ability to conduct such actions as balance by walking on logs and jump long distances down banks landing on both feet without falling, walking in streams to hide their tracks.
- Back tracking evidence concluded It was a planned assault because suspects used cover and concealment consistent with tactical movement approaching the house instead of walking up the sidewalk.
- Back tracking has also proved the alleged incident didn't happen at all due to the lack of tracks.

Tracking at Night

- When tracking at night I prefer to use a white LED light. There is a lot of opinions on different colors of lights and their benefits, but I prefer to be able to detect objects by their actual color as well as their shape. It has been proven that the human eye operates with more endurance under a green light than any other color light, so night vision is equipped with a green image for that very reason. Use what works best for you!
- Looking for tracks after dark you need to be able to manipulate the light at an oblique angle and put the search area between you and the light, so lights worn on the head are the least beneficial light source to use at night when looking for tracks. A more suitable method is to mount your light source on the end of a walking stick so you can cast the light at an oblique angle close to the ground and reach out with the light while shining the beam back towards you, putting the search area at the optimum position between you and the light source. This method also helps alleviate back pain after long hours of searching in the dark.

Other Tactics for Tracking

There are various tactics used in tracking and they all have various degrees of importance depending on the situation, so they are not listed in any order of importance.

1. There are basically two ways to follow someone, by **following footprints** or a line of sign and by using **Tactics**.
2. At the very beginning of a search the ideal situation is to identify the **size, type and pattern** of the individual's tracks you wish to follow. With this information you can share facts that may be used to apply Tactics and speed up a tracking operation.

You establish size, type and pattern by: (continued)

- Questioning witnesses who observed the individual and where they moved about, then locating the tracks
- Observing related tracks consistent with the interest that prompted the investigation
- Ageing sign consistent with the time frame of interest and following it until you acquire outside information to document and share
- Eliminating tracks left by known persons who contaminated the scene and evaluating what is left

3. During any tracking operation, Imagine an awareness bubble and a disturbance bubble.

You should shrink your **disturbance bubble** as small as possible by:

- being quiet all radios, phones, gear noises (rattling, banging) should be made as silent as possible. Reduce talking to a minimum
- Reduce smells no smoking, bold deodorants, gun oil, cook fires etc.
- Camouflage In a tactical situation you must blend into the environment 100% -Paying particular attention to Clothing, exposed flesh, and Black guns

You should expand your **awareness bubble** as far out as possible by:

- Listening for sounds such as – animals spooked, car doors slamming, sticks being stepped on and broken, metal or glass objects, phones beeping or ringing, talking on phones
- Smells – freshly damaged vegetation or soils, smoke, body odors, gun oil,
- Visual clues – unnatural colors, brush moving, familiar shapes, patterns, leaf flagging, tracks, litter

4. Avoid staring at the ground/focus lock –it causes you to force what you want to see onto the ground when you should be looking for disturbances and analyzing them for any related significance. Keep your eyes moving

5. Age early and Index often It is important to know if you are closing in on the quarry. The tracks and sign become fresher. (continued)

6. **Look left and right of the track line** look for items thrown or dropped. Also it is possible your quarry returned on the same road or trail.
7. **Pay attention to Route influencers** natural terrain features that encourages a persons directions. Noises can be route influencers especially in an active search, road noises, door slamming, police radios and, at night lights can attract or deter a quarry
8. **Negative and positive space** don't just look at the trees in the forest, look between them, through them, let your eyes focus on the furthest distances possible when searching
9. **Do not walk on the track line, especially conclusive sign** sometimes you have to walk on the tracks due to restrictive space but try to avoid doing so when possible.
10. **Always know exactly where you are** we don't need two people lost, you can't get back up if you can't tell someone where you are, are you putting your self in danger due to the lack of a tactical advantage?
11. **Vary your vision** kneel closer to the ground, move from side to side of track line to acquire best light angle.
12. Close time and distance gap by **using all available resources**
13. **Stay honest with what you're seeing**
14. **Use all your senses** when tracking: Sight, smell, touch and hearing
15. **Rhythm and balance being maintained by the tracker.** Trackers move a sign line at a rhythm and speed that matches their skill along with many other factors. Trackers will move sign at a speed that establishes a rhythm and when that rhythm changes the tracker needs to assess why, terrain change, light change, weather, sign maker rhythm has changed?

Index

- 
- age, 4, 17, 20, 24
 - Animal Tracking, 6
 - Antipoaching, 7
 - Anti-Tracking, 6
 - awareness bubble, 26
 - Back tracking, 24
 - balance, 12, 13, 15, 24, 27
 - cache, 24
 - Casts, 21
 - color, 10, 11, 16, 17, 25
 - Conclusive, 4
 - consistent, 4, 11, 12, 14, 16, 17, 24, 26
 - contaminated, 23, 24, 26
 - Contamination, 4
 - detection, 4, 5
 - Detection of IED, 7
 - disturbance bubble, 26
 - disturbances, 6, 8, 9, 15, 26
 - document, 7, 24, 26
 - egress, 4, 7, 19, 23
 - Electrostatic Dust Lifter, 22
 - Elimination Tracking, 7
 - evidence, 1, 4, 5, 7, 9, 10, 19, 21, 24
 - examination, 5, 22
 - focus lock, 26
 - Foot Roll, 13
 - Forensics Tracking, 7
 - Frozen Ground, 18
 - grass, 10, 11, 12, 14, 16
 - impact point, 12, 13, 15
 - Index, 26
 - influencers, 27
 - ingress, 4, 7, 19, 23
 - Intelligence Gathering, 7
 - Leaves, 16
 - light, 9, 10, 11, 16, 17, 19, 21, 25, 27
 - litter, 26
 - Movement, 12
 - needles, 17
 - night, 10, 19, 25, 27
 - Officer safety, 5
 - outline, 10, 16
 - passive track, 24
 - pattern, 5, 10, 11, 24, 25
 - Photographs, 21
 - physics, 12
 - Pitch Angle, 14
 - quarry, 12, 22, 23, 24, 26, 27
 - Rhythm, 11, 12, 27
 - Rocks, 17
 - Search and Rescue, 6
 - shape, 10, 12, 18, 25
 - Short Grass, 16
 - size, 5, 12, 16, 24, 25
 - Snow, 19
 - sounds, 26
 - spoor, 9, 22
 - Straddle, 14
 - Streams, 18
 - stride, 12, 14, 15
 - suspect, 4, 14, 18
 - tactical, 4, 24, 26, 27
 - Tactical Tracking, 6
 - Tactics, 20, 25
 - Tall grass, 16
 - termination point, 12, 13, 15, 17
 - terrain, 14, 23, 27
 - Texture, 11
 - Toe kick, 17
 - track traps, 7, 23, 24
 - Trackers and K-9s, 7
 - Trail width, 14
 - type, 5, 16, 19, 20, 23, 24, 25
 - value, 4, 8, 10, 11, 16
 - Vegetation, 17
 - weight, 12, 13, 14, 16, 17
 - Wildlife conservation, 7