NATURAL AWARENESS TRACKING SCHOOL, LLC
657 Coal Hollow Road Christiansburg, Virginia 24073
www.trackingschool.com (866) 678-7225 trackingschool@yahoo.com

KEEPING TIME OF TRACK: TRACK AND SIGN AGING

BY: ROB SPEIDEN

1 ABSTRACT

Many people are drawn to tracking by an interest in reading a story laid out on the ground. For a metaphor, imagine a track on the ground as a letter, and several tracks form a word. Interpreting the tracks to determine the maker, the age of the tracks, and many other features, or words, will form a sentence and eventually a paragraph or more of a story can be constructed from tracks and sign (T/S). The age of T/S is just one of many facets that add to that story. This chapter covers several tools to put in your tracking tool box with regard to aging T/S including a brief explanation of baseline, indexing, wisdom of the marks, bracketing and some limitations of these tools. The use of all five senses to assist in finding and aging T/S will be discussed as shown to provide many points of information from which a conclusion can be drawn. No aging can be learned on a personal level without field experience or "dirt time", so this chapter is accompanied by outdoor exercises aimed at providing an opportunity for the participant to experience T/S aging as conditions warrant.

2 INTRODUCTION

Track and sign aging can be fun to explore in tracking as a hobby, or important in an emergency requiring scrutiny and discipline in determining an answer for search and rescue, law enforcement or military applications (your or someone else's life may be saved by accurate analysis of T/S age). I'd like to convey that aging can be done and at times may be fairly easy, but also show that track aging may not be easy. This chapter does not pretend to be the summary or be-all end-all of study of T/S aging. All topics addressed in this chapter are only briefly discussed and could easily be made into a lifetime study that would still not gather all there is to be learned relative to aging processes associated with that particular topic. There are also many other topics that would fall under aging besides those addressed here that can be observed or studied such as how long moisture transfer stays around, just how old is that discarded banana peel, etc.

2.1 THE TWO STEPS OF AGING

Track and sign aging will be discussed as the act of determining the approximate age of a T/S in terms of how much time has passed between the time that the T/S was made and the present moment in which we are standing there trying to figure out the age. This act of age determination requires two steps. **The two steps of aging are as follows**:
Step 1 – Relate conditions of the track or sign to historical and current environmental conditions, then
Step 2 – Relate environmental conditions to the linear time line.

2.2 SEQUENTIAL AGING

As the intellect likes to do with any topic, aging can be further broken down to specify certain facets. Aging will be split into two types, sequential aging and precise aging. Sequential aging is placing the age of different T/S relative to each other in a chronological sequence from the oldest to the newest, and may not use units of time like hours or days, but does require at least two individual tracks or sign for comparison. An example result of establishing the sequential age of two T/S would be to conclude that "the vehicle tire track is older than the human track because the human track is on top of the tire track". T/S do not have to be one on top of another though, as sequential aging can be used on two or more T/S spaced close to or far away from each other just by comparing characteristics of each T/S.

2.3 PRECISE AGING

Precise aging is determining the age of a T/S in units of time. Examples of precise aging are "the bear track is three days old" or "This leaf was creased yesterday". Either aging method can be made easier by comparing the subject T/S (unknown) in question to the baseline undisturbed environment and the age of an index T/S (known) through comprehensive practicing in various environments.

2.4 NEW OR OLD?

Little practice in tracking or aging is required to realize how old T/S can be or how quickly they can be erased after being made. Research performed by the Leakey family in Africa has discovered human tracks approximately 3.5 million years old, and plenty of fossilized dinosaur tracks that have endured many millions of years are exhibited in museums. But do all T/S hang around to be enjoyed by our grandchildren? Not quite. We can also watch a T/S get erased by wind, rain or other weathering, some just as quickly as they were made. While walking along the dry sandy shore of a small lake in Fort Collins Colorado I turned around to see what the tracks looked like where I had been walking and a gust of wind swept through and made it look as though I (or anyone else), hadn't been there at all – no tracks to be observed or fossilized. The tracks discovered by the Leakey's didn't retain a lot of detail about the foot that made them, just the general shape and some depth. So do all old T/S look old? Be careful of the desire to label a T/S as old in age just because it "looks" old. Often we like to judge circumstances solely by visual appearance. It is quite possible for a T/S to exhibit visual properties that would lead one to believe that it is old when it is actually fresher than thought. An example of that is a track made in moist clay, which subsequently dries out and resists weathering for weeks, retaining much of its detail. Conversely, a T/S that may appear old at first glance can be quite fresh; for example a track made in loose dry sand that loses detail and crumbles as soon as the foot leaves the impression. Generally speaking (or writing), it is possible for a fresh T/S to look old, and an old T/S to appear as though it was just made. Take a look at the two tracks in the following picture and figure out which one looks old and which looks newer (both tracks were made with the left and right shoes of the same outsole design and wear)?

Although the one on the left looks newer because you can see the tread design, it is actually 24 hours older than the one on the right. The one on the left was made when the clayey soil contained more moisture and retained the tread detail better than after the soil dried some and received the impression from the right shoe 24 hours later. I don't expect anyone to realize the exact age in hours of either track, but the point is that an older track can look new, and a newer track can look old. I'm sure you would have guessed the relative age correctly if you were informed of significant weather history including the rainfall event that ended a day before the first track was placed and the sunny warm weather that ensued up to when the second track was placed and the picture taken.

When a precise age is concluded, it is helpful to be able to provide the reasoning of that age with a comparison of how the T/S would be if it were younger or older than the determined age. In other words, if the bear track mentioned earlier is determined to be three days old, how does it differ from a track exposed to similar circumstances that is two or four days old. How would a leaf crease you determined to be a day old look if it was creased two days ago or today instead of one day ago? This critique may not be necessary when just exploring T/S for the fun of it, but should the conclusion play a role in a search for a missing person or a court case as evidence, it may be critical for the observer to be able to discern and defend a T/S as three days old as opposed to two or four. If you are happy calling a T/S age somewhere around two to four days old, you are using a **margin of error**; the time frame between the youngest you think a T/S can be and the oldest it can be according to your conclusions. For some tracking conditions, like dried tracks that have lost the sharp edges in sand in a desert, there may be a large margin of error as it may only be possible to determine a precise age with a margin of error of weeks as opposed to hours. Other tracking conditions, like a track in snow that still has loose flakes or granules that haven't frozen back to the substrate after being disturbed, may have a small margin of error of minutes or a half of an hour.

2.5 RELATIVELY SPEAKING

Being honest about what you can confidently say is often easier said than done, especially when we want an answer either to sound like we know what we're talking about or because our mind wants to know. So here are some answers that may help, because through the years I have learned that accurate answers are quite often not available, so these answers intentionally connote a large margin of error. One of these three choices can be available for a T/S age; relatively fresh, relatively old, or heckiphino. Each of the relative ages will depend on the circumstances of the T/S and surrounding environment. The determination of either relatively fresh or relatively old compares the characteristics of the T/S in question with certain events, such as the time when a person went missing. To say that a track is relatively fresh would indicate that a track was made in the timeframe that the person went missing. To say that a track is relatively old would indicate that a track was made before the person went missing. The heckiphino determination is reached when there are too many variables, more questions that answers, or simply not enough information available to come to a confident conclusion. We will now look at the causes of T/S aging and some tools that can help avoid the heckiphino conclusion.

3 AGING FORCES

I don't want to insult your intelligence, but rather start from the ground up at a look of the aging process and factors. The underlying common denominator in all T/S aging is events; aging occurs as a result of events, including time. Through time pass all of the agents and forces that act on a T/S to age it. The forces that act to age a T/S over time will be divided into two categories; internal forces and external forces, though you will soon, if not already, see how these two categories overlap.

3.1 INTERNAL FORCES

Internal forces are those forces that act to age a T/S from within or below the T/S itself. Internal forces include, but are not limited to, gravity, shrink/swell cycles, freeze/thaw cycles, fauna that live in the soil, and chemical reactions. Gravity will affect a track by pulling particles into the track from its edges, walls or ridges and formations within the track like outsole lug designs. Shrink/swell cycles in clayey soils can change the shape of the T/S and work to break down details within the T/S with changes in the moisture content of the soil. Freeze/thaw cycles will occur as the temperature fluctuates above and below the freezing point of water (zero degrees Celsius/ thirty-two degrees Farhenheit), and can rapidly (over one or more nights) degrade the definition of the T/S by smoothing out edges and displacing small rocks or other particles in the T/S. Soil organisms that live in the soil can disturb the T/S through their daily activities or just being upset at getting stepped on. Chemicals in a plant may react to being exposed to sun or air, as in the color change of a discarded apple or banana peel.

3.2 EXTERNAL FORCES

External forces are those forces that act to age a T/S from above or outside of the T/S. External forces may overlap or act in conjunction with internal forces to age a T/S. External forces include, but aren't limited to, weather (wind, rain, snow and other forms of precipitation, sunshine, temperature fluctuations, humidity, etc.), falling or wind-blown debris (leaves, vegetation, seeds, rocks, etc.) and other T/S makers. Other T/S makers besides weather include wild animals and domesticated pets, vehicles and machinery, and humans such as curious trackers, good-intentioned searchers, and everyone else (hence part of the need to secure crime scenes ASAP).

3.3 WEATHER

Weather is one of those broad categories with elements that can cause either or both internal or external forces to age a T/S such as temperature, humidity, wind, sunshine or rain. Humidity and temperature conditions may add or remove moisture from a broken twig or damaged leaf causing a color change. Initially, the removal of moisture from vegetation often lightens the value of color in the twig or leaf. After an initial drying and lightening, vegetation will often turn darker as it ages in humid environments, or in arid environments the sun may bleach the material making it lighter as time goes on.

Freeze/thaw cycles mentioned above may occur when the temperature around a T/S cycles above and below freezing. Temperature and humidity fluctuations can dry the moisture from the T/S, causing change of value (relative lightness or darkness of a given color) in soil, loss of detail from the edges or cause the shrinking in a shrink/swell cycle of some clayey soils. Swelling, the other half of the shrink/swell cycle, can occur from moisture infiltrating into a track from dew, rain, or local water table (seep, spring or water puddle). Rain drops can also be labeled another T/S maker, falling from the clouds to form a T/S of a rain droplet. Many rain drops may impact and displace soil particles thereby making many droplet tracks and eroding a track so much that it can no longer be recognized as the original track. The time required for rain to completely erode a track depends mostly on the intensity and duration of the rain. Other factors affecting the rain's ability to erase a track include vegetative or other cover over the track shielding it from the rain (or collecting and causing rain drops to fall in a specific location) and the substrate's ability to withstand the force of raindrop impact. The cohesive forces of soil particles such as baked clay may hold the detail in the track through a rain event. Given the same rainfall intensity with different soil properties such as clay or sand will result in significantly different effect on the time a track remains. Weak cohesion among dry sandy soil particles that rain can easily erode would probably shorten the life of a track compared to the example of a track in a clay-based soil, given the same rainfall intensity. It is important to keep in mind that these all of these forces are incredibly variable and volumes could be written on hypothetical situations involving different combinations and results of ground conditions reacting to these aging forces. For the sake of brevity, just a few examples were given to illustrate the concepts. This chapter does not attempt to describe all aging processes but intends to introduce basic principles to assist in understanding how T/S age.

4 AGING TOOLS

What are some ways to place these aging forces into a timeframe to determine the age of a T/S? Some tools useful in interpreting the age of T/S include baseline, bracketing, indexing, and wisdom of the marks. It is also important to be aware of limitations of each of these concepts.

4.1 BASELINE

Baseline is the naturally occurring, relatively undisturbed area surrounding a disturbance that we might call a T/S. An observer detects a T/S because it is different from the baseline. The baseline was disturbed in some way, either snow or soil was compressed, fallen twigs were broken, or some canine placed scat in the middle of your driveway. Because of the change in that one area contrasting the relatively undisturbed area around it, that seems like a T/S. One problem with using baseline to identify a T/S, or in this inquiry to figure out the age of a T/S, is that the baseline can change characteristics within inches from one area to another. Some substrates may be consistent for a large area, but others may change just inches (even millimeters) away from the T/S in question, creating innumerable baselines. If the baseline changes, then so will the interaction of the T/S maker and the substrate, leaving potentially a very different looking T/S that may make interpretation of the age tricky. The use of baseline will be discussed further with the use of various senses.

4.2 BRACKETING

Bracketing is framing the age of a T/S in the linear timeline with an event that happened before and after the creation of the T/S. In other words, bracketing is the process of determining a chronology of events that precede and succeed the creation of a T/S. Two brackets will be conceptualized to contain the timeframe in which the T/S was made. One bracket will be placed far enough back in time so that the T/S was most likely made after that first bracket. The first bracket usually consists of a known event that would have occurred before the T/S was made. Another way of understanding the first bracket is as an event that occurred at a known time, and the T/S must have been made after that event. Examples of first bracket events could include weather events such as wind, a rainstorm, a snowfall, or other track makers such as a vehicle track or an intentional track trap being made on the ground. More subtle first bracket events could include sunshine, the accumulation of dew, frost, or the hardening of a moist soil. The first bracket event should be one that while working on the T/S, you can look back to an event that occurred and the T/S was obviously made after that event. Here is an example track and observations leading to concluding on the first bracket: It is about 10am today, you find a track on a fine sandy road, there are no pock marks from rain, and you know that it rained yesterday morning, stopping about 10 am. The baseline sand exhibits pock marks from the rain, but there are no rain pock marks inside the track. The first bracket would be the rain event, and the track can be concluded to be no more than one day old. Other brackets may further refine your conclusion, such as knowing that you drove along the road at 6pm, and finding that the track in question is on top of your vehicle tire tracks. The second bracket will be somewhere on the timeline after which the track could not have been made. Often this is the time at which the track is discovered by the observer. Obviously the track could not have been made after you found it. Note that time. Then there may be more evidence available to decrease the time gap between the two brackets, closing in on the precise age of the T/S. Using the example above, suppose that upon looking closer at the track you conclude that your vehicle did in fact run over the track in question, a fact substantiated by three more tracks further along the road partially obliterated by your vehicle tracks. You can then bracket the track in question as being made after yesterday morning and before 6 pm. Assuming you didn't run over the track maker, the track is between 18 and 24 hours old.

The main limitation of using bracketing is incorrectly identifying a bracket. You can be safe on the latest time the T/S was made by establishing the second bracket as the time at which you found the T/S. The first bracket may be more difficult to establish especially in environments where dramatic weather changes or rain events don't occur regularly, like in a desert. If a track has rain pock marks inside of it, then the rain event could be used as the second bracket, being careful to note that scattered showers may not cover 100% of some areas. Another difficulty in determining a bracket event may be in an area or season where the potential bracket event occurs very often. An example is winter when freezing and thawing may occur quite frequently making it more difficult to pick a time frame for just one freeze, when a freeze with subsequent thawing could have occurred each night and day for the last week or month. Bracketing may not necessarily give you an accurate and precise answer down to the minute or second, but rather a framework for narrowing down the possibility for a window of time in which the T/S was made, sometimes narrowing it only to relatively fresh or relatively old.

4.3 INDEXING

Indexing is a tool used for gaining information about T/S by establishing a known (part 1) then comparing (part 2) the subject T/S, your index, and the baseline through a series of questioning. Indexing has also been referred to as thumb experimentation (Brown 1999). As soon as you find a T/S you are interested in, create an index (part 1). An index may be making your own footprint next to the subject T/S. An index may be made with your thumb or finger (that's why they call it the index finger :). If indexing sign, you would break a similar twig, crush or crease a similar leaf, or whatever necessary to replicate the T/S. An important point in indexing is creating, as closely as possible, the same T/S. If you are looking at a human track that may have been made by a person running, don't just walk through to leave a track, run. If the person was just walking, don't just step down and pull your foot back out of the track without moving your other leg, actually walk through the area to recreate the making of what you are working with. Indexing can lead to discovering much more information about the T/S that was made besides the age of the T/S, but this chapter is focusing on age. Another point is to make the index T/S in substrate as close to the substrate that retained the original T/S as possible without affecting the appearance of the subject T/S. As mentioned before, be mindful that substrate conditions can change in inches, so there are situations where the index will not represent the T/S in question…oh no…another limitation.

Part 2 of the indexing process is to put to good use that often aggravating inner voice by asking yourself lots of questions that compare the subject T/S, your index and the baseline conditions of the substrate. The extent of questions is limited only by your imagination and curiosity, but here are some just to get started:

- Is this a significant T/S? – a quick judgment made to decide whether it is worth putting more time into studying details of the T/S. The significance of a T/S may be relative to your curiosity, a search for a missing person, or case evidence.
- What are the conditions of the ground and weather when I made my index T/S?
- What substrate was the T/S made on? Characteristics will change between snow, different types of soil, dust on a concrete floor, etc. This can lead to a multitude of other questions.
- Which T/S is on top? This question is an investigation into chronological aging and with one track on top of another figuring out which is on top is usually answered at edges of either track where they intersect one another. Look for a part of on track the is continuous at the edge versus a part of the other track where the continuity of the edge was broken. The damaged one is usually the older one, in place before the one that did the damage to the edge of the older one, no respect for the elders.
- Who or what made the T/S? Answers to this one may provide behavioral clues to the maker related to time of day or year the T/S was made.

- ❖ What were the conditions of the ground and weather before the T/S was made, when the T/S was made and since the T/S was made.

I hope you put an index down before asking these questions because the next question is:

- ❖ What has happened to my index T/S since I have been here asking and answering all of these questions? Any changes (or no changes) in your index since you have spent a few minutes working on the subject T/S can shed some light on the aging processes to which the subject T/S has been exposed.

4.4 WISDOM OF THE MARKS

Wisdom of the marks (WotM) is an excellent exercise first written by Tom Brown Jr. to explore, among other subjects, learning about the aging processes that affect T/S. WotM is the systematic process of leaving T/S at known intervals and a disciplined study of observing the effects of time and aging forces as they affect the T/S that you make. In the interest of avoiding repetition of previously published processes, please refer to Tom Brown's Field Guide to Nature Observation and Tracking. In one sense there is no limit to what one can learn from practicing wisdom of the marks. In another sense the limits of the exercise are such that one can't learn everything there is to learn about all environmental variables. In other words, you can't learn about the aging process of T/S in snow by studying T/S aging in sand in Cancun. Likewise one will need to study the effects of daily as well as yearly weather cycles and their affects on aging T/S. Kent Hicks has taught an excellent aging class that uses a form of WotM as an expansive and detailed study of exploring T/S in many circumstances involving various ground covers, plants and other media. To gain your own encyclopedia of experience from WotM, you will need your own dirt time and leaf time and snow time and…

Consider, though, that one limitation on all of these tools is our own experience. To the chagrin of psychologists, but in the interest of making a point, the brain's functions will be divided into two areas; observation or working in the present, and interpretation or working in the past. All of the senses work in the present moment. When you compare the sensory input to a previous experience, you have moved out of the present into the past. Whether or not you have logged hours upon hours of dirt time, be conscious of your mind's tendency to move to the past, leaving behind sensory input from the T/S in front of you, in the present. In the present, your senses can work to receive information. As a matter of fact, they receive much more information than we can process. "In any given second, we consciously process sixteen of the eleven billion bits of information out senses pass on to our brains." (Nørretranders, 1991) Switching back to the past involves comparing what information you are currently receiving from any of your senses and comparing that with memories of past experiences with similar information. It is easy for us to place a label or an age on a T/S (that bear track is two days old), and halt the observation process. While determining an age, try to balance the former experiences with present moment experienc**ing**. Instead of just saying "Oh yeah, I've seen that before and that means the track is fresh" from an interpretation you've quickly made, work between comparison of what you have experienced before, and using all the senses in present observation mode to feed more information into your biocomputer. An example of the combination of the two is "I see rain pocks in the track, and remember that the last track I made did not have rain pocks in it until after it rained, so this track was made before the last rain". The present sensory experience is observing rain pocks, and is compared with the past experience of similar circumstances that produced those pocks, then making a conclusion based on the combination of present experiencing and a past experience.

Other tools for practicing aging are time to study (a.k.a. dirt time), curiosity (internal desire), imagination to seek possible explanations, and multiple factor reasoning (as opposed to single factor reasoning – making a judgment from one factor). I haven't heard the importance of multiple factor reasoning explained better than this paragraph in the preface to Harold Gatty's Finding Your Way Without Map or Compass:

> *In using these methods of observing and interpreting the evidence of the natural things about us, it is important to remember that under difficult conditions too much reliance should never be placed on any one observation since it may perhaps be an exception to the general rule. It is the combined evidence of a number of different indications which strengthens and confirms the conclusions to be drawn from them individually.*

5 FIVE SENSES

To reiterate the point made above about multiple factor reasoning, while investigating the age of a T/S, more than one sense can and should be used. This section will look at the use of the five traditional senses and applications in both sequential and precise aging.

5.1 SIGHT

The visual sense is the one that we depend on the most for input in our daily activities. "Image is everything" and "Seeing is believing" are just a couple of the clichés relating to our dependence on sight. The aspects of visual sensory input that can be used to assist to interpret T/S come from the art world. The concepts of color, value, texture, shape, edge and movement are elements of visual perception presented as the basic items that allow us to see an object as being apparently separate from other objects. These elements can also be used as a language for a person to describe what they are seeing in a track that leads to an aging conclusion.

5.1.1 COLOR

The color of the T/S may change drastically over time as will be discussed below with regards to aging vegetation. If you make an index similar to the sign that you see in vegetation, such as a crease or bruise, and the color of your index is close to that of the sign in question, then the age of the sign is likely to be fresh. But if the sign is different in color than your index, the sign is probably older.

5.1.2 VALUE

Many a time I have heard the aging of a track in soil be referred to as a change in the color. As a soil's color is predominantly determined by the chemical makeup and organic matter content in the soil, over a short period of time (months) it is unlikely that the soil color will change from age. Usually the change in soil that occurs over a short time period occurs during moisture content fluctuations. What is often expressed as a color change is actually a change in the value of the soil (and I don't mean you can get more for it at the pawn shop). Value is relative lightness or darkness. Contrast can also be used to discuss a value change. When soil takes on moisture, the value usually darkens, and conversely lightens when the soil dries. When a soil surface that has been exposed to drying environmental conditions is disturbed, quite often the underlying soil will be darker than the very surface of the soil because soil underneath retains the moisture. Once this is exposed, it may contrast the surface by appearing darker. If it dries after being exposed, over time it can return to the original value of the surrounding soil. Conversely, when rain starts or dew has settled, the soil at the surface may be higher in moisture content than the underlying soil, and a disturbance may expose soil that is lighter in value than the baseline. These phenomena may occur with other ground covers such as leaves, pine needles or other vegetation.

5.1.3 Texture

Visually speaking, texture refers to whether the surface of a T/S looks rough or smooth. As a track is usually a compression in the ground cover, it is often initially smoother that the baseline around it. Aging, through wind, rain and other weather phenomena act to roughen the surface of the track until eventually it returns to baseline. That process isn't always the case though, as the opposite can also be said about the texture of a track and baseline. A track made in soil or snow with the ridges and depressions in the track appearing as a disturbance in comparison the smooth baseline of the surrounding ground. As the track ages from many forces, the tendency is for the details of the tracks to be removed as the depressions fill in and the ridges collapse, smoothing out the area of the track until it eventually returns to the baseline. As another example of visual texture change, I have seen tracks where the surface of the track was rougher than the baseline when the top layer of clay stuck to the persons boot and was removed, exposing the rougher sandy soil underneath. The aging process of this track made its surface smoother as clayey soil eventually recovered the sandy soil via erosion.

5.1.4 Edge

The edge of a T/S is the boundary between the disturbance and the baseline. The edge of the track can be an excellent indicator of a track's age, then again, it can be difficult to determine a track's age from the edge deterioration because the soil may have been in a condition that did not form or hold an edge right when the track was made. If the edge of a track is sharp and well defined, it could be a fairly recent track especially if in a sandy soil, although a clayey soil can hold an edge for quite a while before deteriorating. I have yet to see a track's edge become sharper from aging. The edge of a track will generally wear down and round off as weather and other aging forces act on it. Eventually most tracks edges wear so much that they return to baseline and become undetectable. So many variables come in to play that you can see how important it is to keep track of weather events as well as putting in dirt time to observe these changes first hand.

5.1.5 Shape

The shape of a track is the overall area as defined by its edges. A track's shape may change some from freeze/thaw or shrink/swell cycles over time. Consider a track made in snow and when the snow melts the shape of the track can increase in size. A track made in moist soil may have its shape distorted slightly by freezing causing the moisture to expand slightly in and around the track, similar to the swelling caused by a clayey soil absorbing more moisture in temperatures above freezing.

5.1.6 Movement

Movement of substrate may indicate a relatively fresh T/S. If grass or other vegetation is still returning to its original position before it was stepped on or soil particles are falling from the edge into the track, you may be minutes behind the track maker. Just because there is no movement in the T/S though, does not necessarily mean that the T/S is old; movement can be just one of many factors indicating a track's age. Recently a colleague Ken Adams noticed movement in fresh tracks that turned out to be ants upset by the disturbance.

Although the visual sense is strong in humans and we depend on it for a large part of our sensory input, we should not depend solely on sight to judge the age of a track as a multitude of information can be assessed from other senses.

5.2 TOUCH

One sense other than vision that can provide extraordinary amounts of information pertaining to T/S aging is the sense of touch. Charles Worsham developed and taught these concepts that can be used to gather information about the age of a T/S as they pertain mostly to tracks in soil, but these concepts can be used in other ground covers such as snow, grass, leaves, etc. Mike Hull also wrote about these in a paper for the 1999 ISPT Tracking Muster. While investigating any of these qualities, place one or two fingers of one hand at the baseline (undisturbed) area as close to the track as possible and one or two fingers of the other hand in the track and feel for each of these. Once you compare the baseline and track in question, compare those two with your index. Simultaneous feedback and comparison can be gained by comparing the baseline and track at the same time, or you can go back and forth from track to baseline to index with just one hand. Do not rely on just one of these characteristics to provide the answer to the tracks age; just like using various senses, use as many of these as possible before reaching a conclusion.

5.2.1 HARD/SOFT

Was/Is the ground hard or soft? Previously mentioned was a question to ask about the condition of the ground cover when the track was made. Part of answering this may shed light on whether the ground was soft when the track was made leaving either a well-defined deeper impression or hard leaving a shallow non-descript track. You will then need to look at how the ground feels now, is it still soft, yielding to slight pressure from your fingers, or hard and rigid to the touch. If the ground was soft when the track was made, and is now hard to the touch, then one needs to look at recent weather events to see what has caused the ground to harden (i.e. drying from sun or wind exposure). Other variables affecting the character of the track besides weather and ground conditions would be the weight of the maker, and the speed at which the maker was moving.

5.2.2 ROUGH/SMOOTH

Is the baseline, track and your index surface smooth or coarse compared to one another? This relative texture is not necessarily the natural texture of the soil (clay vs. sand)? After the weight of the track maker compresses the ground, a track exposed to aging forces will generally become rougher as time passes, and may eventually return to baseline conditions. Generally, bigger the difference in roughness between the track and baseline may indicate the track is fresher. Balance that with the track being possibly older with a greater contrast between your index and the track in question. Examples of a track getting rougher as time goes on would be rain drops falling and creating smaller disturbances in the large track compression and a freeze/thaw cycle moving soil particles apart that were previously neatly packed by a footfall.

5.2.3 WET/DRY

Is the disturbed area wet or dry, and how does that compare to the baseline and your index. If both the track and baseline are dry but your index is moist or wet (from soil moisture being exposed as you made an index disturbance), then enough time has passed for the track to dry out, look at recent weather changes for drying conditions. If all three are dry, then other conditions need to be used for more info. The larger the discrepancy between moisture content at the surface of the track and your index generally point to the track being older. If there is moisture flowing into the track, you have a fresh track.

5.2.4 WARM/COOL

One of the greatest tools for age determination in T/S is moisture dynamics. Along with wet/dry comparisons, tracks may feel warm or cool compared to your index and the baseline depending on moisture content. After making a fresh track in soil as an index, feel the index and compare with the baseline. The index may feel cooler than the baseline because the moisture content in the exposed soil is higher than that of the baseline which has had time to dry out. This will be less evident as the temperature nears freezing or precipitation has fallen recently. Generally, the closer the track is in temperature to the baseline the older it is, and the more it resembles your index in wetness, the younger it is. However, if it is raining or a rain fell recently, consider the possibility now that the surface contains more moisture that subsurface soil, so a track made recently may be drier and warmer than the baseline. Your index and observations of recent weather events should help sort that out. Another use of temperature comparison would be touching an animal's bedding area to see if there is warmth in the ground left from their body heat, or holding your hand over a pile of ashes of someone's extinguished camp fire; still smoking, very fresh, still warm, not much older than a day, if that.

5.2.5 STICKY/NON-STICKY

Also related to the ground cover's moisture content will be how sticky or adhesive it is to your fingers. Press down lightly on all areas then lift up quickly and check for clayey soil or organic debris to be stuck to your fingers. A ground cover that is moister will stick to your fingers after you touch baseline, track or index. A dry ground cover will probably be less sticky. Another exception is some situation where the ground cover may be extremely or completely saturated and will just drop off of your finger from too much water.

5.2.6 RESISTANT/NON-RESISTANT

Consider also the resistance of particles of soil or organic debris to move at your touch. When pressure is applied to the baseline, track or index, do the particles remain and take a lot of pressure to dislodge, move as a clump with a little resistance, or do they yield and move or crumble and break apart easily. Differences between the three areas are indicators of change through time, for example a track found in sand can show plates of sand around the edge of the track. The index leaves crumbled edges that are rounded off, and touching the track easily breaks apart the plates. The track was made when the sand was moist and cohesive, making the plates. Enough time has passed in dry weather that the sand dried out and any slight pressure breaks apart any plate that was previously formed because the moisture that acted as a glue of sorts is no longer present to hold the sand particles together.

A caution about using touch to compare baseline versus disturbance needs to be presented. More often than not a footfall will compact an area making it soother than the surrounding baseline. This smoother track area can present more surface area of the ground cover to the touch than the potentially rougher baseline. It may be misleading to feel the baseline and feel the disturbance if the finger touches more surface area of the disturbance than the baseline. To correct for this difference in surface area one must be conscious of the tactile differences presented between the flattened disturbance and the baseline and not use the results of this examination alone for interpretation.

5.3 HEARING

Hearing a track has worked for me generally on a forest (deciduous or coniferous) floor or other vegetated ground covers. Others have indicated this worked for them in snow and soil. A theory behind using sound to locate or get an idea of the age of a track is that when the ground cover is stepped on, the leaves, twigs and other litter is crushed by the weight of the track maker. The baseline ground cover around the track has likely not been disturbed as much. Tapping on the ground cover lightly with a couple fingers will make the sound of leaves and litter rustling as each leaf, twig, etc. rubs against the things around it as they are pressed by your fingers. Tapping in the area previously compressed by the track maker often yields a softer, dampened noise compared to the noise made by relatively undisturbed baseline around the track. The track area often makes less noise because the compressed ground litter (track area) has been pressed in to place aggressively during the footfall or vehicle tire imprint. The baseline usually is noisier because it hasn't been compressed as much. This one is interesting to experiment with, but calling on the baseline limitations previously discussed, it is sometimes difficult to get a ground cover that is uniform in the track area and the baseline as leaves don't fall or mix the same way over each inch of the forest floor. For an aging comparison, compare the baseline, track and your index for sound volumes. As the track ages, it may approach the sound quality of the baseline as the ground cover rearranges itself. If the track is relatively fresh, the quality of sound should be closer to your index. Nothing works 100% of the time. A way that hearing can indicate a fresh T/S is to listen to a disturbance moving (discussed in movement above) back towards baseline immediately after being disturbed. As leaves or other vegetation moves back, a slight rustling may be heard.

5.4 SMELL

The bacteria Actinomycetes are constantly working to digest organic material, breaking it down to be consumed. A byproduct of this process is a chemical that gives soil it's "soily" odor. When a soil or organic ground baseline is disturbed by a track maker, the surface is churned up somewhat and releases some of the odor. This is the strongest odor that humans can frequently detect in a relatively fresh track. The track can be confirmed by placing the nose close to the ground and inhaling. If the nose is over freshly disturbed area, there should be a strong soil odor. When I use this as another factor to confirm the location of a track, I go for the boundaries of the track by moving my nose over the ground until I get a weak odor or no soil odor at all. As time passes, and the disturbed area recuperates from its injury, the odor dissipates. A track older than a day is likely to smell no different than the surrounding baseline. Another use of the sense of smell is by detecting the odor of freshly disturbed vegetation. A common example is going by an area where someone just mowed grass. The mowing caused damage to the grass blades and they release an odor – a cause and effect situation similar to walking across grass whereby the track maker damages the grass blades and releases the odor, though it probably won't be as strong as the smell of a freshly mowed yard, but it's there for a short while and some search dogs are trained to track that fresh disturbance.

5.5 TASTE

It's a stretch, but taste can be used to confirm or deny the approximate age of a T/S. So far the only use of taste I have experienced for aging T/S is that some plants have different flavors in their tissue (some more appealing than others) such as birch trees in the cambium layer or mint plants. If a sign is detected as damage to a plant, tasting the injury site may provide another indication to the freshness of the injury if there is a strong flavor. If the injury is old and dried up, then it is possible that no flavor will be detected. Please do not use this if you are not sure whether a plant is edible or poisonous.

6 FLORA & FAUNA

6.1 ANIMALS

I have often been awed by the ability of a person to tell the age of a track because a beetle crawled over the track and this type of beetle only comes out at night. So I wanted to learn about some potential biological indicators or T/S age by watching the behavior of beetles, earth worms, ants, flies and other beings that I have no idea what they are called (even after sending pictures of their sign out to entomologists). The easiest, most consistent rule that I learned from the small teachers is this: Their most dependable consistency is inconsistency. Try as I did, I have yet to discover a reliable rule usable from these guys in aging T/S, except to break an assumption often encountered in search and rescue: "I walked into a spider web so nobody has been down this trail in a long time or at least since yesterday". Personally, I have experienced a spider completing its web in less than an hour, and I have several testimonies from colleagues including a video from Tim Healy, a border patrol agent who, after leaving his truck for approximately 45 minutes, returned to find a spider had opened up shop with a complete web over a foot in diameter between the door and the truck frame. The spider was read its rights. Ants have been observed on occasion in a T/S area scurrying about their re-organizational duties after a footfall disturbed an area, but they have also taken hours to start rebuilding a compressed hill of excavated soil, sometimes never re-excavating the hole. Another indication of a fresh T/S is an insect that was stepped on and remains in the area writhing from the crippling impact. Other than flies abandoning scat piles after the pile is up to a couple days old, continue to watch arachnid, other insect and earthworm activity for sometimes they will tell whether a T/S is relatively fresh or old, but for the most part their behavior seems to be erratic and undependable for exact answers, gosh…they sound like humans. Large animals are no different. Just because you see raccoon tracks on top of t your question tracks does not mean the questions tracks were made before nighttime. Raccoons and other "nocturnal" animals, under conditions other than being rabid, do, on occasion, come out during the day time. Supplies and demands play more significance in an animal's daily habits than rules or observations written by humans in books. The animals don't read those books anyway.

6.1.1 SCAT

As a side note to using animal to assist in aging sign, I'd like to share a recent experience to illustrate two points; (1) scats dry from the outside to the inside and (2) the rate of drying in completely dependent on a wide variety of variables. While in Idaho I encountered a deer scat in the early afternoon that fell partly on a log and partly on the ground. The segment on the ground wasn't warm but it was shiny, smooth, green and moist; visually it appeared so fresh that it could still have been falling. It had fallen to the ground and lay amongst grass that sheltered it from the sun and Idaho's arid breeze. The part that fell on the log, however, remained above the ground, grass and any protection. It was more exposed to the elements and had already dried out enough for the green color to turn darker green on the external top part of the scat. Spreading the scat apart revealed that the inside retained the moist, lighter green character similar to the scat on the ground. The mucous appearance was gone on the top but remained underneath the portion on the log, and the texture of the scat on the log appeared rougher on the top (from loss of the mucous-like covering and vegetation fibers starting to show) than the smoothness underneath of the same segment of scat. Although the scat had probably been voided by a deer earlier that morning (by the lack of drying in the lower segment), the scat higher up on the log had been drying for a few hours, and visually appeared significantly different from the segment on the ground.

6.2 PLANTS

One sign of passage is damage to plants. As with all other subjects discussed here, there is no hard and fast rule for how plants, or even singularly a plant will show a progression of aging after it has been damaged or affected by another being's actions. A plant's response to injuries such as being crushed, creased, torn, etc. will usually be to seal the interface between the damaged and still viable unaffected area. An injury to a live plant leaf, stem or other part starts with a release of fluid right around and in the injured area. The amount of fluid released will depend on the plant and the color of the fluid is usually clear but can be colored as in the milkweed or dogbane that releases a milky-white substance and bloodroot that releases a red fluid when damaged. For most plants that release a clear fluid, the injured area usually immediately takes on a darker value of the original color of the plant tissue (most often green). Depending on external factors such as temperature, humidity, and exposure to wind and sun, the next stage of the plant's injury aging is usually for the fluid to dry up and the injured area appears to turn a lighter shade of the original color. Given any reasonably dry or breezy conditions the moisture can dry (turning the dark green to light green) in a matter of minutes if not an hour or two. In a day or two the injured tissue that has lost the ability to carry on the plants processes usually dries up completely often resulting in a clear appearance in some plants. The next color changes involve the injured tissue turning brown, or drying and deteriorating into a white colored tissue. Often the last stage of a plant's green tissue being damaged is turning black, which it will remain for quite a while (if the injured area doesn't get eaten). This is a general progression of damaged plant tissue aging that I have observed, but not all injured plant tissues go through all of these colors, and they certainly don't all take the same amount of time to attain a certain color before going on to another color.

Another tendency with an injury to plant material is specific to a crease or tear in either a live or dead leaf. When the leaf is first creased or torn, it is often possible to unfold the crease or place the two torn parts back together in the leaf and see that if any damage has occurred, other than a value change from the fluid release, the crease or tear will fit snugly back and at times appear that there is little damage to the leaf. In comparison, after the edges of the leaf's injury site have had time (days or weeks depending on variables) to degrade, an old crease or tear will not fit back so easily and gaps or rough edges can be observed where there was once continuity. I have also noticed that branches and twigs, when freshly broken, are usually lighter at the outset of the break than days and weeks later when they tend to fade to darker shades of the original color or browning altogether. When a break is first made in branches, twigs or a tear in a green leaf, it is often possible to observe fine filaments at the break which over time degrade and are unlikely to be seen in a relatively (days to weeks) old break of plant material.

7 CONCLUSION

Aging tracks or sign can be an interesting addition to a fun hobby, or a necessary decision in evaluating a clue in a search for a missing person or at a crime scene. Starting with the ability of new T/S to look old and old T/S to look new, the complexity of aging T/S grows and grows as soon as one ventures to explore all of the variables involved in determining the age of a T/S. Tools such as baseline, indexing, and bracketing are very helpful while seeking a conclusive age especially when combined with practicing wisdom of the marks in various ground covers and environmental situations. Using all of the senses as well as gathering as much information is just as important as the need to arrive at an accurate conclusion. Good aging is most accurately determined by following a two-step process of relating the conditions of the track to environmental conditions and weather history then associating those conditions to the linear timeline. Many of the topics described above from plant injuries to soil dynamics remain for all of us to study in further detail, as well as many other topics unexamined in this study such as tracks made by moisture transfer, aging discarded clues, etc. Please take the tools and processes briefly discussed in this chapter and prove them either correct or incorrect for yourself. However you learn T/S aging, the real teachers are always out there waiting for you to ask them about aging and readily providing many answers and even more questions.

FOR MORE INFORMATION PLEASE CONTACT:

Rob Speiden
trackingschool@yahoo.com
Natural Awareness Tracking School, LLC
www.trackingschool.com

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