

SCENT MOVEMENT IN AVALANCHE DEBRIS: A DOG HANDLER'S PERSPECTIVE

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ABSTRACT: Avalanche search dogs are trained to locate human scent rising from avalanche debris. Handlers must understand how atmospheric conditions affect scent availability to the search dog and how search tactics might be adjusted to improve chances of success based on observations of these atmospheric conditions. Dog handlers must understand that human scent moves through the debris as vapor (probably along with water vapor). Usually this movement is from warmer areas, towards cooler areas. The movement is not always from the bottom toward the top. As the snow may be warmed or cooled during a search effort, scent may rise, hold in place or even be driven deeper into the debris.

Heat energy being lost from or gained by the avalanche debris, establishes a profile of relative temperature differences within the snow and there-by drives the direction and rate of movement of the scent. Greater relative differences along this profile will cause scent to move more readily from warmer to cooler snow. Heat energy is transferred to and from the debris by well understood mechanisms. Radiation to the atmosphere, re-radiation from cloud cover, precipitation, sun and wind are especially important. Each can be discussed at length. The dog handler should have a working understanding of these and assess their affects throughout each search. For example, a clear cold night allows for lots of heat loss from the debris. A smooth temperature profile develops, with warmer snow on the bottom and cooler snow at the surface. Scent moves easily to the surface and is quite available to the dog's nose. This occurred at an avalanche accident near Eureka, Alaska where, after a clear cold night, dogs gave digging alerts directly above the subject who was buried 3.25 meters deep.

Heat energy can be added to the debris by warmer air and/or precipitation. This addition may be strong enough to keep the scent from reaching the surface. It may even be able to drive the scent deeper into the snow. In either case, dogs may not alert as no scent is available for them to alert on. At Turnagain Pass in Alaska, this was likely the situation. As the search for victims of a large avalanche in 1999 continued into several days, dogs were unsuccessful. A mixture of snow and rain was falling during much of the search effort. Scent seemed not to be reaching the surface. At the location of one victim, a dog was able to alert only after approximately 50 cm. of snow was removed from the surface.

As often as not, heat transfer is occurring in both directions. Scent then is likely moving slowly and is available to the dog's nose in small quantities. Handlers must recognize these conditions and work their avalanche dogs in appropriate (i.e. tight, close) patterns. On Mt. Magnificent near Eagle River, Alaska an avalanche which released on a cool, sunny morning buried three men and their two canine companions. Early in the search effort that followed, avalanche dogs were able to locate a subject, a dog and some gear buried in the debris. Changing conditions made searching become more difficult. The debris was losing heat to the clear sky but the sun was adding heat to the snow and also warming the air. At a point searches could "feel" the snow change and began working very tight grids with the dogs. The last buried subject was located by a dog advancing on a 30 cm. grid.

Conditions prior to the avalanche accident are generally unimportant to the scent picture as the

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avalanche usually obliterates any existing temperature profiles within the snowpack. The dog is working the debris and a profile is developing as the search progresses, making scent more or less available. Dog handlers (and search managers) need to pay attention to existing and ever changing conditions in order to use appropriate tactics with their avalanche dogs. They may need to adjust tactics as things change. If initial hasty and grid searches are unsuccessful, such tactics as working a much tighter grid or behind probe lines may be in order. It may be more effective to work dogs very early in the morning after leaving the debris to cool for the night. On some searches, removing snow with heavy equipment and then working dogs might be an effective and efficient approach. Creativity may be needed to match appropriate tactics to existing conditions.

Difficult finds can be made by being aware of the weather and understanding how it affects the temperature profile and thus scent movement through the debris, then making good tactical choices based on the conditions from the time of the accident forward.