HANDLER PERCEPTIONS OF OPTIMAL SCENTING CONDITIONS FOR AVALANCHE RESCUE DOGS

Ryan R. Gould*, Eeva Latosuo

Alaska Pacific University, Anchorage, AK, United States

Abstract:
Little research has been done to directly link environmental factors such as wind speed, humidity and air temperature to scenting conditions for avalanche rescue dogs. This study identifies ideal environmental factors based on handlers' practical experiences. Responding to an online survey, 61 handlers from throughout North America identified and ranked key factors that influence scent flow. The collective experience of the respondents totals over 1500 rescue training sessions and more than 350 avalanche missions. Responses to the survey yielded a significant amount of previously uncollected data of handler perceptions. In the preliminary results, the importance of wind was emphasized repeatedly. For example, when asked to rank environmental factors in order of importance, wind was indisputably the most important factor (average response 1.3; on scale 2=ideal, -2=problematic). Additionally, light wind speed was rated as an ideal wind condition (1.8; same scale). In open-ended questions, respondents echoed this point, with nearly 70% of handlers identifying light to moderate winds as the main factor present when dog worked well. More data analysis will be conducted through summer 2012 to determine conclusive and comprehensive results. Final findings will help develop objective experiments to further evaluate optimal scenting conditions.

Key Terms: Avalanche rescue dogs, Dog handlers, Scenting conditions, Environmental factors, Practical experience

1. Introduction: There has been little research done to directly link environmental factors to the optimal scenting conditions for avalanche rescue dogs. These canines are useful tools for avalanche rescue, and they are capable of detecting human scent under up to 12 meters of snow. However, the factors that help human scent to percolate to the surface of the snow and transport it to dog's nose is a science of its own. In fact, some people call it almost an art. The reliability of dog rescue response has been at times questioned. Most recently, Atkins pointed out that in 2000-2010, there were no live rescues by avalanche dogs. Is this because dogs don't always work well or is this a problem of using dog response appropriately? This research initiates the investigation of which environmental conditions allow avalanche dogs to work well. While there is a general understanding of the scenting mechanisms (Burnett; Helton; Schroon), there has never been a collection of handler knowledge about which factors are most important. Through an online survey, handlers' first hand experiences and perspectives were gathered, recorded and analyzed to determine, what the optimal conditions are for use of dogs in avalanche rescue.

2. Methods: Data were collected with a voluntary online survey targeted at current or retired avalanche rescue dog handlers. A large number of handlers (n=87) were reached through an email invitation to participate in an online survey posted on SurveyMonkey website. There were a total of 61 complete responses gathered over 15 day collection period. Responses came from throughout North America, but no information about handlers' home area was gathered. Handlers were asked to answer survey questions based on personal observations from working and training their dogs with an intention to minimize

*Ryan R. Gould, Alaska Pacific University, Anchorage, AK, USA; telephone: (267) 337-2925; Email: rgould@alaskapacific.edu

preconceived notions inferred from other handlers, readings or seminars.

3. Survey: Survey methods and questions were approved by Alaska Pacific University's Research Review Board. Questions were in a short multiple-choice format. Respondents were asked to rank a number of environmental factors and how they affect scenting conditions. For each set of questions, handlers were also given the opportunity to write down relevant comments collected as additional qualitative data. In the end of the survey, a number of questions were asked to determine demographic information of respondents. The data were collected from handlers with variety of levels in canine experience and avalanche training. For example, one respondent had relatively no avalanche training, rescue experience and showed no past history of ever working with avalanche rescue dogs. However, on the other end of the spectrum, some respondents were very experienced, with multiple individuals having worked with avalanche rescue organizations for as long as 30 years. The collective experience of the respondents totals over 1500 rescue training sessions, 379 avalanche missions and 159 trained avalanche dogs. The respondents who gave only consent to participate, but did not respond to any other questions were excluded from the survey.

4. Results:

4.1 Overall ranking of important scenting factors

Handlers (n=59) ranked the six major environmental factors (air temperature, wind, precipitation, snow conditions, time of day, and seasonal progression) in order of importance for avalanche dog scenting conditions. Distinctly, 35 (59% of respondents) rank wind as the most important factor. The next important factor is snow conditions, ranked second by 20 (34% of respondents), and ranked as the most important factor by 19 handlers. Precipitation received only very few votes as first or second important factor, but clearly is ranked third by 26 handlers (44% of

respondents). Air temperature is ranked fourth by 21 handlers (36% of respondents). The time of day and seasonal progression are tied as the two least important factors ranked as fifth or sixth by 53 handlers (90% of respondents). These answers signify the importance of wind, snow conditions and precipitation as the major environmental factors for scenting conditions according to dog handlers.

4.2. Wind

Handlers (n=61) answered the question, if six categories of wind speeds (calm, light, moderate, strong, extreme, variable) make the scenting conditions ideal, favorable, hard or very problematic for avalanche dog work. According to 36 handlers (61% of respondents) light winds create ideal scenting conditions, while 34 handlers (59%) consider moderate winds still favorable. Decision on hard wind conditions divides the group; 33 handlers (58%) perceive strong winds difficult, while 28 handlers (52%) rank calm wind and 26 handlers (45%) variable wind difficult. Extreme wind is considered very problematic for scenting by 32 handlers (56%).

While this result is not surprising, it documents well the handlers' foundational awareness of wind. In the open comments, handlers were very articulate on wind direction and topographic effects on wind. Additionally, almost all handlers were able to give answer to this question. Dog handlers pay attention to wind throughout the training and missions. It is the number one factor the handlers will key in during avalanche incidents.

4.3. Snow conditions

Handlers (n= 59) ranked how snow conditions affect scenting conditions on a scale of easiest to most difficult. The question was two fold asking handlers to evaluate both slab characteristics and the type and amount of new precipitation on the snow pack.

Debris ranking was quite simple. Soft slab is ranked easiest snow condition for scenting by 45 handlers (80%), while hard slab ranks in the middle by 37 handlers (64%). Wet slab is considered to be the most difficult

debris for the scenting work by 47 handlers (84%). Both hard slab and wet slab hinder the scent movement through the snowpack, while soft slab allows scent to percolate through the more porous medium more readily.

New precipitation ranking also followed handler common sense. The easiest scenting condition is no new precipitation on surface, as answered by 53 handlers (96%). New snow makes scenting harder by the deposition amount, lesser amounts still consider easy (1-5", ranked as second easiest by 44 handlers; 6-12", ranked as third easiest by 33 handlers), but when more than one foot of snow has accumulated conditions are ranked difficult (1-2', ranked as third most difficult by 24 handlers; >2', ranked as most difficult by 30 handlers). Interestingly, rain shares the title for the most difficult scenting condition as ranked by 18 handlers. New precipitation traps the scent inside the snowpack, especially during and after the warm storms. Yet, some handlers note that their canines work well independent of the amount of new snow on the surface. The large amount of new snow does affect dog's ability to travel freely on the debris field, which can sway handler answer toward difficult rating, even if the perception is not necessarily based on the actual scenting environment.

4.4 Air temperature
Handlers (n= 59) ranked how different air temperatures (very cold, cold, moderate, warm, very warm) make the scenting conditions ideal, favorable, hard or very problematic for avalanche dog work. The answers had lot of variability without any unanimous notions. There is no clear winner for the easiest air temperature range, but there is a more consensus on rating moderate and warm temperatures (10-32F) favorable for scenting (33 handlers, 58%). Similarly, cold and very cold (<-10 – 10F) temperature range is rated problematic for scenting (22 handlers, 39%). The very problematic conditions are in the both extremes. More handlers also answered that they do not know the answer or that none of this affects scenting conditions. Depending on home area, very cold or very

warm temperatures might be rare occurrences for dog team.

Temperature gradient facilitates molecule movement through the snowpack, including the skin grafts and gases that human subjects dissipate while buried (Albert, Burnett). Handler responses on temperatures align with this theory. If the snow and air temperatures are similar, scenting conditions become problematic. These conditions can be either very cold, as after long cold spells resulting in not only air but also snowpack becoming very cold, or very warm, as developed in later spring when snow pack is going isothermal and air temperatures are getting warm.

4.5 Other factors
Some of the environmental factors in the survey were not on handler radar. For these factors majority of handlers answered that condition either does not affect the scenting or that they do not know if it has an effect. The conditions that produced lukewarm result included relative humidity, cloud cover, and high altitude.

Most handlers (40 of 58, 69%) considered that open terrain offers easiest scenting environment, while buried shrub or forested terrain makes scenting harder according to some handlers (20 of 55, 36%).

4.6 Open ended questions:
Handlers (n=54) answered the optional question to describe *conditions when dog worked extremely well*. The absolute winner in the favorable factor category was light or moderate winds (74%, 40 of 54 answers). 28 of 54 handlers (52%) mentioned air temperature, but there was no clear answer to the most conducive temperature range, since the answers varied between "colder" to "upper thirties". Dry snow conditions were mentioned in 21 answers (38%). Other commonly mentioned factors included: clear sky (9 of 54); easy travel conditions (7 of 54); open terrain (7 of 54); no new precipitation (6 of 54). As an anomaly, only one handler mentioned a big cup of coffee before the search as an important factor for success.

Handlers (n=53) answered the optional question to describe *conditions when dog*

did not work at all. Most commonly mentioned factor was wet snow conditions (20%, 11 of 53 answers). Temperature extremes, especially very cold temperatures (11%, 7 of 53 answers), had also hindered dog performance. Surprisingly, too calm conditions received only three mentions, but high wind speed or gusty winds were mentioned six times (10% of answers). Rain was a defining factor in six answers (10%). Other notable comments on difficult scenting conditions included: snowpack with a well defined crust, melt freeze crust or ice lens; search area with tree wells; vegetation debris on the slide; and deep burial of subject.

5. Discussion: The results of this survey give a baseline on handler understandings of major environmental factors that play a role in avalanche dog work. However, this research did not include any questions relating to the time and the depth of the subject burial and the time lapse between the burial and the rescue response. These

are important factors to investigate when evaluating the success of dog search. More advanced statistical analysis would reveal more information in this data set. For example, a detailed comparison of the answers between experienced and novice handlers would be interesting.

6. Conclusion: Avalanche dogs are valuable tool in avalanche rescue, but certain environmental factors affect their efficiency. Handler perceptions define optimal scenting conditions as light to moderate winds, no or little new snow on top of soft slab, with moderate (10-20F) air temperature, in an open terrain. Difficult scenting conditions include extreme wind, more than 2 feet of snow or rain on top of wet slab, with either very warm or very cold air temperatures, in dense vegetation. Future research can develop objective experiments to follow up on the subjective handler framework on learning more about the optimal scenting conditions for avalanche dogs.

Bibliography
1. Albert, M. R. "Thermal Effects Due to Air Flow and Vapor Transport in Dry Snow." Journal of Glaciology 38.129 (1992): 273-81. Web.
2. Atkins, Dale. AVALANCHE RESCUE: THE UNITED STATES EXPERIENCE. Proc. of 2010 International Snow Science Workshop. Print.
3. Burnett, Patti. Avalanche! Hasty Search: the Care and Training of Avalanche Search and Rescue Dogs. Phoenix, AZ: Doral Pub., 2003. Print.
4. Curran, Allison M., Paolo A. Prada, and Kenneth G. Furton. "Canine Human Scent Identifications with Post-blast Debris Collected from Improvised Explosive Devices." Forensic Science International 199 (2010): 103-08. Web. 15 Apr. 2010.
5. Helton, William S. Canine Ergonomics: The Science of Working Dogs. Boca Raton: CRC/Taylor & Francis, 2009. Print.
6. Schroon, G. A., and J. C. De Bruin. "The Ability of Dogs to Recognize and Cross-match Human Odours." PubMed.gov. 1 Dec. 1994. Web. 21 Jan. 2012. <http://www.ncbi.nlm.nih.gov/pubmed/7813994>.