



## **STUDENT MANUAL**

### **CANINE SEARCH SPECIALIST TRAINING**

### **UNIT 5: SCENT THEORY**

#### **Unit Objective**

Upon completion of this unit, you will be able to explain the theory of scent as it relates to the canine search for live victims in a collapsed structure.

#### **Enabling Objectives**

You will:

- Explain the rationale for understanding scent movement;
- Describe the factors that may affect scent;
- Describe how scent is transported away from the victim; and
- Plan the search of a collapsed structure to efficiently work canines into scent.



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## I. Objectives

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## II. Rationale

Dogs “see” the world through their noses. Scent is 3-dimensional to them. Our job is to put them where they can best detect scent.

## III. The Canine Olfactory System

### The Nose Knows

There is a lot we do not know about how the canine nose actually works. However, if we describe it in its simplest terms; humans are highly visual creatures. We process colors, shapes and textures in the blink of an eye without any forethought. Dogs, on the other hand, “see” the world through their nose, not eyes.

### Canine Olfactory System

Olfactory sensory cell estimates:

- Human = 5 million.
- Fox Terrier = 147 million.
- German Shepherd = 220 million.

### Contributors to Human Scent Complex

In general, the mechanism of human scent involves the skin, fat layer, and glands. Other contributing factors are genetic, bacterial, dietary, and environmental. So what does this all mean to dogs? What is scent to a canine?

Scent comes from dying or dead, bacteria laden skin cells. These dead cells are called **rafts**.

Rafts are shed from the:

- Skin, and



- Respiratory and digestive tracks.

It is the bacterial activity on these dead skin cells that produce the scent that is carried in the wind currents.

***Cells + bacterial activity + secretions=vapor cloud (oils, esters, acids, gases).***

Skin raft loss is approximately 40,000 per minute! A canine can detect certain odors at extremely low concentrations, about 1 in 10 quadrillion.

"If one gram of butyric acid was made to evaporate evenly in all the rooms of a ten story office building, a man would barely be able to perceive its existence by standing in one of the rooms. However, if the same gram of butyric acid was diluted to fill the air above the entire city of Hamburg, the dog could still perceive it at an altitude of 300 feet."

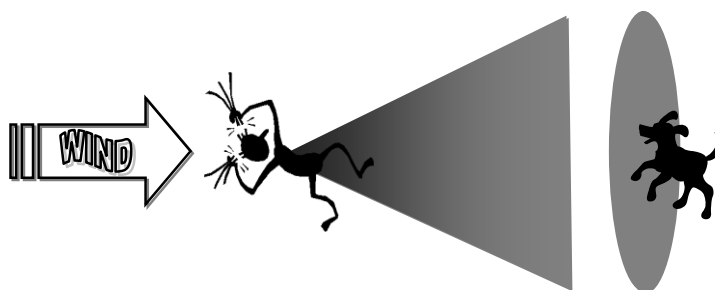
—William Syrotuck (Scent and the Scenting Dog, pg. 13)

**Butyric acid** is a fatty acid occurring in animal fats and plant oils. It is the unpleasant odor you smell when butter goes rancid.

Despite the aforementioned description of incredible canine scenting ability, there are many factors that influence the effectiveness of a canine's work in search and rescue. With proper training and management, canines can provide invaluable assistance in the search for survivors of a disaster.

### **How is scent dispersed?**

The scent is heaviest at the source and is dispersed away from the victim in a cone. This scent cone represents an open area, with consistent wind speed and direction.





## **IV. Influences on Scent Dispersal**

### **Environmental Influences**

The environment will influence how scent is dispersed. Environmental influences include:

- Temperature,
- Wind strength and direction,
- Humidity, and
- The sun.

Some of the factors to consider in light environmental influences are as follows:

- Air warms more quickly than the ground. In updrafts air cools more quickly than the ground.
- A warmer environmental temperature may increase bacterial activity, whereas colder air may inhibit bacterial activity (depending on how cool it is).
- If the wind is too strong, the scent cone disperses; this when you have to search the edges of the pile.
- Moisture is necessary for bacterial activity.
- Light dew and high humidity increases scent vapor, but a heavy rain will suppress the scent.

### **Temperature**

Scent is affected by hot and cold temperatures. Additionally, the temperature of the victim versus the temperature of the environment will also impact the scent's dispersal.

### **Wind**

Scent is also affected by the wind's strength, and direction.

### **Humidity**

Humidity (high, low, or raining) will affect scents movement. Moderate wind and humidity are better scenting conditions than extremes.

### **Sun**

The sun, or lack of it, will also influence scent dispersal. This is directly related to meteorological conditions such as:

- Clear,
- Overcast, or
- Night.

Dusk and dawn are optimal scenting times for canines—just like it was for their ancestors in the wild.



When working on a rubble pile you need to keep the following in mind:

- As the sun warms the top of the pile, warm air currents will rise and create updrafts.
- Cooler air flows up to replace rising warm air.
- Scent will usually be strong in the morning and at dusk before approaching cool air blocks the warm air.
- There may be less of a difference in temperature on top of the pile versus the bottom, because there are less strong updrafts.
- As the top of the pile cools, air settles—this may block the scent from rising. The updraft off a warm body may be weak—you need to work lower on the pile.

### **Structural Influences**

A building's architecture that is of concern in relation to scent dispersal includes:

- Elevator shafts,
- Closed stairwells,
- Windows, and
- Breached floors and walls.

Scent will channel through these openings. Additionally, the construction's porosity, or building material used in the structure, will have a strong influence on the channeling, pooling, and absorption of scent. Scent flows well in the following materials:

- Broken rubble,
- Light framing, and
- Brick.

## **V. Scent Flow and Detection**

### **Scent Flow and Detection**

The FEMA canine is trained to indicate the presence of a live victim by performing a focused bark alert at the point in the rubble where the strongest live human scent is emitted.

### **Detection versus Location**

Dogs are SCENT detectors, NOT victim locators! Canines will alert where the scent is emerging.

If concrete solid slabs/large chunks exist, scent may travel back and forth across many solid layers/floor surfaces. Many layers may have to be removed before the true direction of the victim can be determined.

WHAT IF A DISTRACTION IS FOUND? Do not assume to know. Remove it and search with canine again!



WHAT IF A LIVE VICTIM IS FOUND? Our canines cannot tell us how many victims they have found. Search again after the victim has been removed!

#### Scent Source Detection

You need to be able to interpret your dog's alert. Then you need to document, and debrief. The debriefing should be Handler to STM and Handler to Handler.

#### Scent Flow–Funneling

**Spotters:** Be aware of any other sources of live scent that may affect the search area -workers staging, onlookers.

Stage downwind!

If you are working interior areas after rescue work, allow enough time for the scent to clear or ventilate quickly. **SEARCH AGAIN WITH THE CANINE!**

#### Scent Flow–Pooling

IT IS necessary to consider all the variables influencing each search area. A cooler interior can draw scent, and it will pool in the lowest areas. This is more likely in conditions of light, or no wind. Remove the distraction, then ventilate and re-search the area.

#### Typical Collapse Patterns

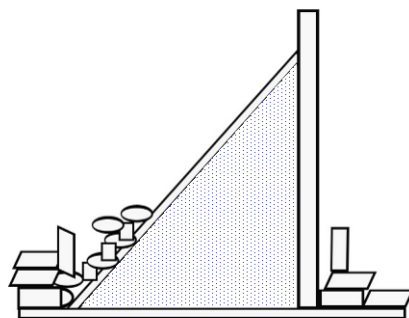
The type of collapse also must be taken into consideration when searching. Typical collapse patterns are:

- Lean-to,
- “V”,
- Pancake, and
- Cantilever.

Keep in mind, you can have a strong canine alert, but the victim may not be at that immediate spot because the updrafts have been channeled by the type of collapse.

#### Lean-to collapse

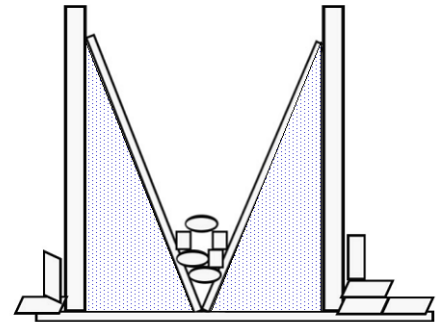
In a lean-to collapse, with only one side fallen, the scent can be channeled across the rubble pile. Where must “the nose” check in the early afternoon? How about at night?





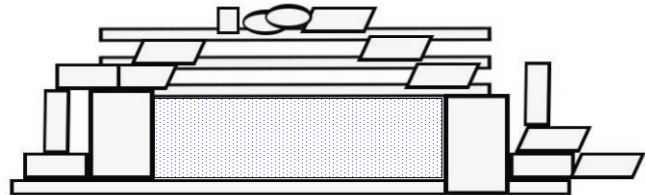
### **V-collapse**

In a “V” collapse, where a slab breaks downward in the middle, scent can rise straight upward. Where may the scent be at noon?



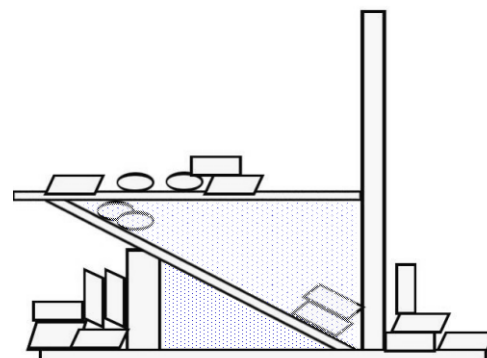
### **Pancake collapse**

With a pancake collapse, if there are no cracks in the slabs, the scent will rise only along the sides. It would be a good idea to search downwind and along the sides of the collapse.



### **Cantilever collapse**

In this type of collapse scent can be funneled out any of the sides. However, this dependent on where in the void the victim is located.

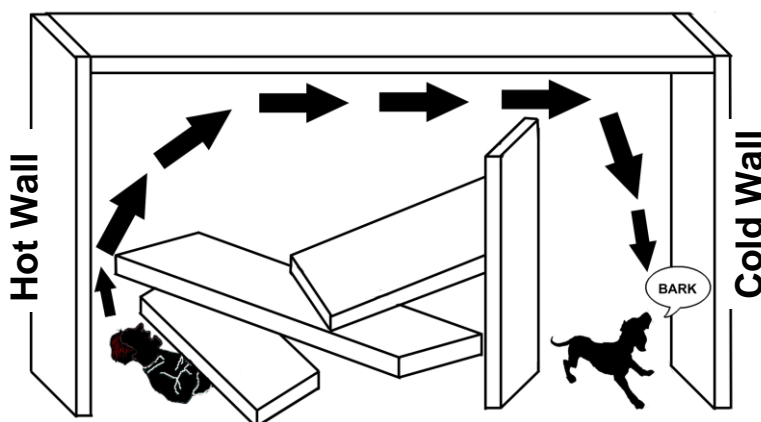






Scent is transported upward by the rising warm air drafts along the wall on the left; blocked above, it travels across the room.

When the scent hits the cool wall, it cools and drops.



### Using your scent knowledge

Identify current scenting conditions by using surveyor's tape or a puff bottles/talc to mirror the scent pattern present. Interpret the pattern of alerts. Send the canine from a position that maximizes probability of detection.

### Considerations

Be sure to take into consideration:

- The presence of hazardous materials, such as chemicals, foam, or fuels;
- Live versus dead;
- The number of victims found; and
- Distractions (noise, people—canine's drive carries him through).

Also consider that:

- Canines are worked regularly (athletic condition, but have same limitations as humans—time working; and
- Physical and mental breaks are important.



## **VI. Scent Theory/Air Movement Demonstration**

The instructors will conduct a field demonstration using smoke generating devices (smoke bombs). This will provide you with visual examples of how scent transport occurs at a disaster site.



## **Demonstration**

### **Unit 5: Scent Theory/Air Movement Demonstration**

**Time:**

10 minutes

**Purpose:**

To have you observe visual examples of how scent transport occurs at a disaster site.

**Directions:**

The instructor will disperse smoke bombs at the rubble site to provide a visual representation of scent flow.



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## **VII. Unit Summary and Evaluation**

### **Unit Summary**

This unit's enabling objectives were:

- Explain the rationale for understanding scent movement;
- Describe the factors that may affect scent;
- Describe how scent is transported away from the victim; and
- Plan the search of a collapsed structure to efficiently work canines into scent.

### **Unit Evaluation**

Please fill out the evaluation on this unit.



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