When establishing training scenarios, it is common to vary the amount (i.e., mass) of target used. One session may involve several ounces of the target material while the next session involves several pounds. While this is good practice, it has resulted in narrowed thinking: many canine trainers and handlers think solely about target mass when attempting to vary odor intensity. In reality, surface area and concealment of the target are much more important factors.

During olfaction, canines are detecting the gaseous molecules and/or microscopic particles that are released from the surface of the target. If environmental factors (e.g., room temperature) are held constant, the larger the surface area of a given substance, the greater the number of molecules/particles being released. Consider, for example, a drinking glass filled with water. Evaporation only occurs from the surface of water.
evaporate. If that same glass is spilled onto your kitchen floor, however, the surface area of the resulting puddle is many times that of the water in the glass. As a result, that same amount of water evaporates overnight. In the context of explosives detection work, one pound of black powder in an open bottle has significantly less odor than that same mass of powder distributed across several scent bags.

Furthermore, in order for detection to occur, those molecules or particles released from the surface of the target need to be physically transported to an area the dog will sniff. The distance and degree of obstruction of the path to the dog’s nose will have a marked impact on odor intensity. As these factors increase (e.g., deeper hides and/or forms of additional containment), odor intensity is reduced. This reduction occurs because the molecules/particles are diluted by the (larger) encompassing volume of air and some are even ‘lost’ due to chemical or physical interactions with surrounding surfaces.

Understanding the role of surface area and concealment is valuable as it allows handlers and trainers to better manipulate standard targets and common training exercises in order to expose their canines to a greater range of target odor intensities, ultimately better preparing the team for the infinite number of scenarios they may encounter operationally.