## DEICING SALT ALTERNATIVES

One of the most common chemicals used for roadway deicing is sodium chloride (i.e., salt). White-tailed deer, like most animals, are attracted to natural and artificial salt deposit locations in their normal course of feeding. It has been speculated that the use of salt for roadway deicing may attract white-tailed deer to the pavement and/or roadside, and that this could result in more deer-vehicle crashes (DVCs) when deicing salts are in use.

No research literature was found that specifically or scientifically documented any attempts to prove whether white-tailed deer were attracted in larger numbers to a roadway right-of-way due to the use of sodium chloride for pavement deicing. The increase in DVCs that might occur due to the use of roadway deicing salts also does not appear to have been studied. However, some research in Canada did consider the potential moose-vehicle crash impacts of roadside pools with high concentrations of dissolved roadway salt (*1*). That study is discussed below. A study that focused on the effectiveness of chemical deer repellents also proposed that it might be mixed with roadway salt, but that study is discussed in the repellents summary of this document.

### Literature Summary

Documentation about the possible impact of roadway salt use on white-tailed deer movement, and the number and location of DVCs does exist, but these discussions are only anecdotal in nature. For example, it has been observed that the largest number of DVCs in a state often occurs in October and November, but these months are not typically those with a high level of roadway salt usage. However, this observation does not address what percentage of DVCs might be due to deicing salt during the months when it is used. Two journal articles also offered the expert opinion that the use of roadway salt did contribute to DVCs, but these appear to be based on field observations and/or a knowledge of animal behavior rather than scientifically organized research results (*2, 3*).

A related study in Canada focused on moose movement and moose-vehicle crash impacts of roadside pools with high levels of dissolved roadway salt (*1*). The study considered a 96.9-mile **(**156-kilometer) segment of the Trans-Canada Highway in Ontario, and in the late 1970s the locations of the salty roadside pools along this segment were identified (primarily by the existence of significant moose tracks) (*1*). Within the study area 169 salty pools (i.e., a specific conductance of greater than 500 µ) were identified, and the amount of moose trampling was scored from zero (not used) to five (heavily trampled) at 162 of these pools (*1*). Most of the pools were given a ranking of two or higher, and those with rankings of three or more typically also had wildlife trails leading to them (*1*). The pools actively used by moose were high in sodium (Na) and chloride (Cl) in comparison to the nearby lakes (*1*). A strong relationship was also found between the specific conductance of a pool and its sodium content (*1*).

The study also compared the use by moose of the saltwater and freshwater pools, and investigated the locations of moose-vehicle crashes (occurring from May to September 1979 and 1980) with respect to the nearest saltwater pool (*1*). Not surprising, a sample of 13 natural lakes and streams did not show signs of concentrated moose activity, but 14 small pools with a high specific conductance (i.e., greater than 1,000 µ) had a statistically higher trampling ranking than the other 23 in the sample considered (*1*). Overall, 39 moose-vehicle crashes occurred in the study area during the time periods considered (*1*). Approximately 43 percent of the crashes occurred within 328.1 feet (100 meters) of a heavily used (i.e., a ranking of three or more) roadside pool (*1*). Approximately the same number of crashes, however, occurred more than 984.3 feet (300 meters) from a heavily used pool (*1*). If it were assumed that moose-vehicle crashes could occur randomly and equally along the study segment approximately 8 percent of the crashes should have occurred within 328.1 feet (100 meters) of a heavily used pool and 72 percent further than 984.3 (300 meters) from this type of pool (*1*). The validity of these assumptions for analysis purposes, however, is open to debate.

The researchers make several conclusions and suggestions (*1*). Their general conclusions were that saltwater pools are a significant attraction to moose and that approximately half

of the moose-vehicle crashes that occurred along the study segment were at or near these pools (*1*). They suggest that a reduction in the use of roadway salt (e.g., sodium chloride) may have a number of benefits but should not be expected to eliminate moose-vehicle collisions. In fact, in some areas with little natural salt only a small amount is needed to attract animals (e.g., the amount needed to keep the sand spread on some roadways from clumping) (*1*). The researchers discuss some options to the use of sodium chloride and the costs that are related to their use. It is suggested that if some salt substitutes (e.g., calcium chloride in Ontario) could be used in smaller amounts than the sodium chloride they might be economical and also produce a reduction in moose-vehicle collisions (*1*). Finally, the researchers suggest that the elimination of some of the roadside pools might be possible and/or that better drainage might be provided to flush the pools more quickly (*1*). If a roadside saltwater pool must remain a repellent could also be added to it during the highest moose-vehicle crash time periods (*1*). It is proposed, however, that the removal or management of saltwater roadside pools should preferably only be done if other salt sources are provided artificially (*1*). Animals may just move to another location along the roadside if this supplemental salt is not provided (*1*).

**Conclusions**

Research into how much of an impact the use of roadway salt may have on the number of DVCs occurring at a particular location is needed. In the past, suggestions and/or studies of sodium chloride and its alternatives have typically focused on the water quality environmental impacts of these chemicals (e.g., surface runoff) rather than their potential DVC impact. Only one study was found that attempted to consider the quantitative impacts of roadway salt on animal-vehicle collisions, and it considered the patterns of moose-vehicle collisions near roadside pools with significant concentrations of salt. The runoff from the roadways apparently produced these pools in an otherwise sodium deficient area.

The study of moose-vehicle collisions and roadside saltwater pools was completed from 1979 to1980 within the province of Ontario in Canada. It was found that moose were highly attracted to roadside pools with levels of high salt concentration. The moose-

vehicle crash data also showed that approximately 43 percent of the 39 moose-vehicle collisions in the study area occurred within 328.1 feet (100 meters) of a saltwater pool. In addition, about the same amount occurred more than 984.3 feet (300 meters) away from the pools. The researchers compared the distribution of the observed moose-vehicle crashes with what might happen randomly along the study segment. It was found that the percentage of moose-vehicle crashes near the roadside pools was much higher than what might randomly be expected. The assumption involved in this comparison (e.g., all locations have an equal chance for a crash), however, and the general variability of moose-vehicle crashes were not discussed by the researchers. In addition, no comparisons were completed that could result in conclusions about how many of the 39 crashes might not have occurred if the saltwater pools were eliminated. This is a key question that needs to be answered. This research study does appear to show, however, that the use of roadway salt does have the potential to increase animal mortality in some manner, and that more specific consideration of this subject is required.

If the results of future roadway salt usage studies are able to determine the magnitude of its relationship with DVCs, the impact of existing and proposed deicing alternatives should then also be evaluated and considered. However, these evaluations must also consider the effectiveness of the roadway salt alternatives at clearing the roadway pavement (which increases general safety) and the other benefits and costs of their use.

**References**


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