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MINIMIZING THE EFFECT OF SALTING ON TREES

TECHNICAL MEMO

Salt used for melting ice on pavements in northern climates is quite harmful to trees and soil. The most common and least expensive form of ice melting salt is sodium chloride, which is the same salt we put on our food. But this salt is the most harmful type of salt to plants. It is also can be harmful to people, the larger environment, and the concrete and metal infrastructure of our cities. Salts damage plants in two ways: salt in the soil and salt in the air, both of which have different effects on a tree.

Salt in melting water saturates the soil, increasing the soils salt content. Roots find it harder to uptake water as the salt levels increase. At elevated salt levels, water within the root can actually be drawn out of the plant. In the winter, street trees need little water so the effect of the salt is quite low. It is only after the leaves emerge that the real damage begins. If the spring rains are heavy enough and come before the emergence of leaves, the tree suffers little impact. As soil volumes increase and the drainage rates within that soil increase, the damage is less. Including large amounts of rapidly draining soil under the pavement combined with a well-designed rain water harvesting system provides nourishing natural rainfall in the spring and summer months while also flushing any sidewalk salt that enter these soil volumes. Reducing the amount of salt used in winter and flushing the walks and soil with fresh water in the early spring will reduce impact to the tree and the environment. Eventually each of these chemicals work their way through the soil and surface water systems, increasing the salt levels of the ground water.

The second way salt affects trees is through the air. Salt used on roads is stirred up and atomized into the air by rapidly moving vehicles. This salt coats the buds and twigs of plants. The process is similar to the root where the salt draws moisture out of the plant, but often this airborn salt becomes concentrated on the upper parts of the plant with each wetting and drying cycle. Buds become deformed and growth is slowed. On many plants, including plane trees, a common result is clusters of multiple and stunted branch tips called “witches brooms.” These are unsightly and slow the growth of the tree.

Fortunately there are alternatives to sodium chloride which are less harmful and may be more effective at preventing ice on pavements. The alternatives are still “salts” but have less impact on the plants and surrounding environment. Sodium chloride is effective at melting ice only down to temperatures of 15.8° F (-9° C). When the air temperatures are lower than 15.8° F (9° C) the surface water can still freeze. Two other types of ice melting salt are available that freeze at lower temperatures and are less harmful to the trees and the environment.

Magnesium chloride is one such better option for melting ice. It is effective at temperatures down to 5° F (-5°C). It is the least harmful, common ice melting chemical to plants, soil and infrastructure. The cost of this product is significantly higher that sodium chloride but the long-term benefits including lower operating temperatures, reduced plant impact and less damage to infrastructure and the larger environment provides benefits greater than the additional cost. When temperatures drop below 5° F (-15° C) the only alternative is calcium chloride. This material is slightly less harmful to plants and infrastructure than sodium chloride but is not as beneficial as magnesium chloride.

Salt use of all types can be reduced, which increases the benefits to plants and infrastructure. Using the lowest recommended application rates and being careful to clean up spills is critical. Using liquid forms has been shown to reduce application rates. Applying small amounts of the chemicals before the ice event usually results on lower overall application amounts. Adding small amounts of sand or other grit can reduce the need for applications as well.

Finally, early spring cleanup by flushing the sidewalks with water and adding fresh water to the water harvesting system is important to the success of the trees. The upper parts of the trees can be flushed with water to reduce the impact on bud deformity from air born salt. The Bloor Street water harvesting system is designed to overflow into the streets during periods of rapid rainfall. This can be used to the advantage of washing the sidewalk with high volumes of water without washing much of the remaining salt into the tree soil. The water harvesting system is also designed to allow large volumes of water to be added directly into the water harvest distribution system by placing the hose into each inlet structure. This will allow flushing of the system in early spring prior to bud break.

Recommendations

1. Use magnesium chloride in the early and late parts of the winter when temperatures are above 5° F (-15° C).
2. When temperatures are predicted to be below -5° F (-15° C) use calcium chloride.
3. Use liquid forms of each chemical.
4. Educate maintenance personnel on proper techniques to reduce application rates.
5. Flush the sidewalks, beds and water harvesting system each spring after the last ice event and before the plants bud out. Wash the canopy of trees at this time.
6. Using larger quantities of well-drained soil (at least 0.75"/1.9 cm per hour) will reduce the impact of water born salt on the tree. A minimum of 500 cubic feet (14 cubic meters) with 1,000 – 1,500 cubic feet (28 – 42 cubic meters) preferred, will significantly reduce the impact of water born salt by giving the tree a large buffer against salt concentration.
7. For trees planted in areas of poorly draining subsoils (less than 0.25"/.6 per hour) install subsoil drain lines when planting the tree or improve the drainage rates of the subsoil by loosening the compaction in the subsoil. The combination of larger soil volumes and better drainage allows salt to be flushed through the soil by spring rains.

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