Article 3

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Influence of Snowmelt Dynamics on Stormwater Runoff Quality

by Gary L. Oberts, Metropolitan Council, St. Paul, MN

Potential water pollution associated with melting snow are a concern to watershed managers in northern climates. In fact, in some urban areas, substantial portions of the annual load of pollutants such as hydrocarbons, metals, solids, nutrients, and chlorides come from snowmelt and early spring runoff events. Thus the annual cycle of pollutant build-up and subsequent release during snowmelt can be a real threat to the attainment of water quality objectives.

This article examines the mechanisms involved in snow pollutant accumulation and the movement of various pollutants from the snowpack. With this knowledge practitioners can plan management actions to anticipate changing flows and pollutant concentrations. Techniques that can be incorporated include the designation of "salt-free" areas near key streams and wetlands, and dumping plowed snow in pervious areas where melt water can infiltrate.

The Snowmelt Sequence

Snowmelt can be described as a predictable process with three distinct stages (Figure 1). The first melt stage is called *pavement melt*. As the name implies, it occurs when deicers are applied or the sun shines on heat-absorbing paved areas. These applications result in a winter-long sequence of chemically-driven melt events in which very saline water carries accumulated road pollutants into drainage systems and local receiving waters.

The second melt stage involves the more gradual melt of snow piles adjacent to road surfaces. *Roadside melt* contributes runoff intermittently as chemical splash and solar radiation gradually reduce piled snow. The final stage of the snowmelt sequence is the melt of non-paved pervious areas of the site, such as grassed lawns. The *pervious area melt* stage has the potential to contribute a substantial volume of runoff quickly, particularly when accelerated by a rain event.

Runoff Quantity

The volume of runoff generated by each of the three melt stages is dictated primarily by the amount of snow and the weather conditions (Table 1). In most cases, runoff produced during pavement melt is not substantial. The end-of-season melt of the snowpack (i.e.,

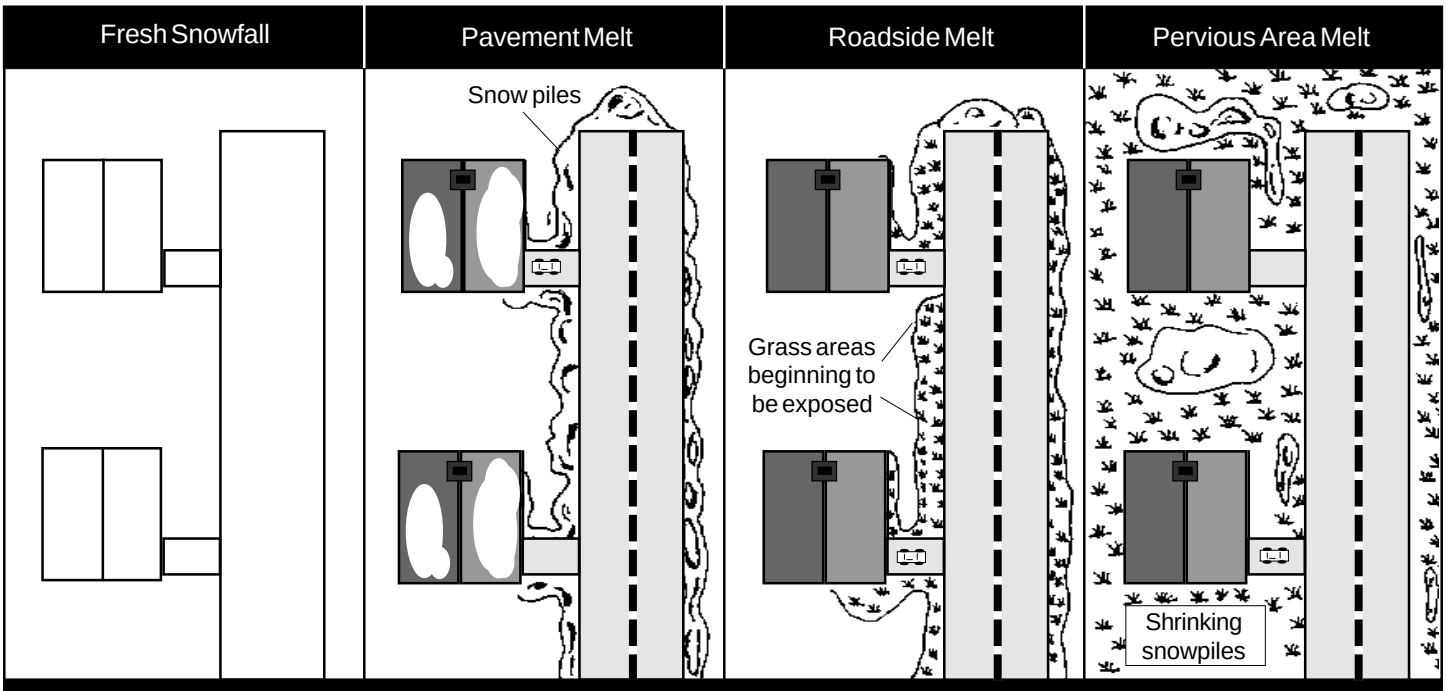

Figure 1: Representation of the Snowmelt Sequence