

Overview: Soil and the Spring Thaw

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You have all seen highway signs indicating the period of spring thaw and reduced truck loads throughout the northern US and all of Canada -- or walked across grass that is just beginning to thaw from the winter making deep footprints or tire marks that would never sink like that during a strong summer rainstorm. You may have noticed decks that moved or gates that stick, then un-stick. Some things sink, some rise and some do both. What is it about the spring thaw that makes landscaping so unpredictable and delicate? Some cold climate science first, and then we will see how that affects our day to day structures in the north. The first three to four feet of the crust of the earth receives heat from two sources: the sun and the core of the earth. In most of northern North America, the core of the earth sends up heat at around 7-12deg C (45-54degF) all year round -- well above freezing. It is the temperature above the soil that changes with the seasons. As freezing temperatures set in during the beginning of winter, the soil begins to freeze, from the top down. Since there is always heat from the bottom, it takes continuous cold from the top to drive the frost line lower and lower. If there is no clay in the soil, the freezing moves down rather steadily, with little movement in the soil. When there is a lot of clay in the soil, things change. Clay soil freezes in layers, called ice lenses, drawing water up to the forming lens of ice and actually drying out the soil an inch or more lower down. Only when the soil under the lens is sucked dry will the cold temperatures move deeper into the soil and begin to form a new ice lens. Each lens expands, just like an ice cube in the freezer forms a bump on the top, and pushes the lenses above it even higher -- and hence we get frost heaving. For more details check out ICE LENSES. Although ice lenses can grab onto the sides of posts and even foundations to lift them up, we avoid the more direct formation of ice under structural supports by putting our house foundations as well as fence (Fence post depth) and deck (Supporting Outdoor Structures) supports below the local frost depth. Now let's go to the spring thaw. We still have a small constant heat coming up from below trying always to thaw the ground, but the real thaw comes more quickly from the top down. Imagine this block of ice that is sitting there just below the top of the ground. Depending on the depth of frost in your locality it might be as shallow as 6 inches in Vancouver to as deep as 4 feet in much of the rest of Canada. No rainwater or snow melt can percolate through this block of ice to flow into the water table. But the rain and the melt keep coming. That means that the little layer of thawed out soil on the top is quickly completely saturated. This is the marshy soupy landscaping that you should simply stay off of for a couple of weeks to avoid damaging it. If there is a fair amount of clay in this soil -- it will expand and paving stones and other surface landscaping will probably heave temporarily upward, until this soil begins to lose its excess water. It is best to let this soil drain to a normal moisture content before undertaking any repairs, like that jammed gate, because clay soils will shrink as they lose water and the problem may just go away. If you walk on paving stones that are on a mushy foundation, you will force some of that clay out to the sides, and when it shrinks back to normal, the paving stone will drop lower than normal -- if you stayed off of it until the thaw was well advanced, this doesn't happen and the heaved stone will just go back to where it came from. All saturated soils are too fluid and basically unstable. We actually have to wait until that hidden block of ice under this area finally thaws out, letting the water flow downwards and drain the surface before working on it or even trying to access winter damage. Even the highway trucks in our northern climate need to carry lighter loads until the frost is gone allowing the water to drain and the soil to return to its normal strength. This frozen landscape that can't percolate off surface water is also the cause of most flooded basements. In this case, simple landscaping to run surface water away from the house will handle most of the spring basement flooding problem: Yard Drainage.

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