

Blame the Ice Age for Your Dirt!

BY PAIGE EMBRY

I moved a flagstone path in the front yard of my home in Wallingford recently, since I thought it would make more sense to put the path where people actually walked. What a bad decision that was, from a gardening point of view, because beneath that path was the expected construction sand and gravel and below that was—well—crap. I recognized this crap, though. It was compacted glacial till—an ugly, orangey mix of sand, silt and rocks of all sizes.



Till is not always crap, but it is often enough that my first response on seeing it was to sigh heavily. Some till has fewer rocks than mine or certainly doesn't run to ones the size of

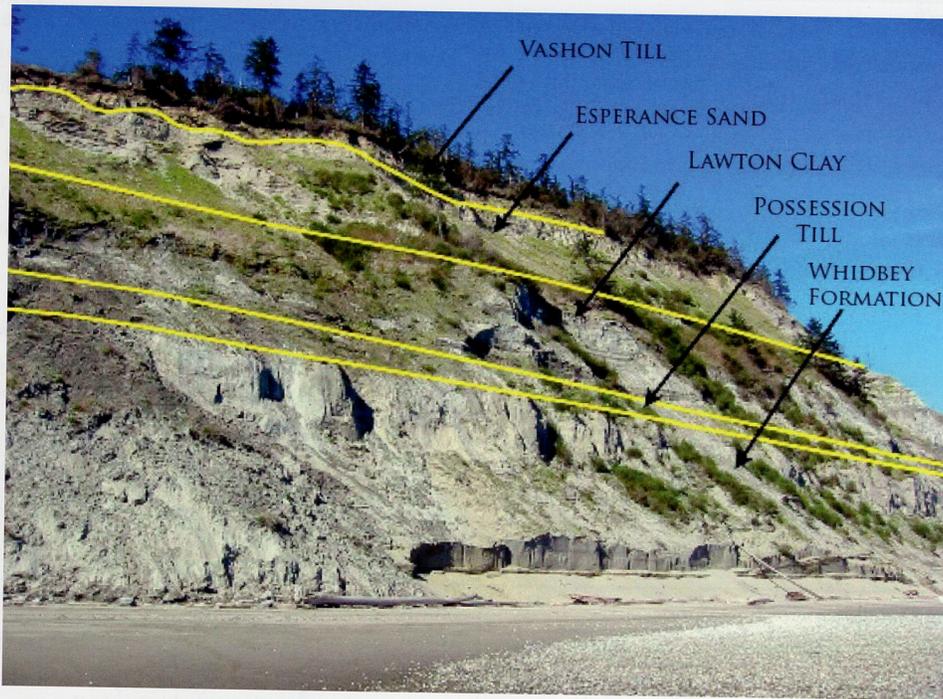
footballs. All those rocks make digging difficult. Also, with till you may be dealing with the dreaded hardpan 18 to 36 inches down that impedes water flow and stops roots dead in their tracks. Thank you, Ice Age!

Pretty much everyone in Seattle and the Lower Puget Sound has the last Ice Age to thank, or revile, for the soil they have. In fact, Seattle's entire landscape—its long north-south running hills, its lakes and valleys—are all due to the glaciers that have been coming and going through town for the last two-plus million years. Glaciers erode and sculpt the landscape and eventually deposit all that eroded material. It is all this erosional debris in its many



INSET: The glacial till—aka “crap”—in the author's front yard.

ABOVE: Wedgwood Rock, a famous glacial erratic near the neighborhood of Wedgwood, Seattle. Large glaciers can carry and deposit boulders just as easily as they can small grains of sand. (Photo by Paige Embry)



A great place to view the glacial strata of the Puget Sound Basin is at Double Bluff Beach on Whidbey Island. (Photo courtesy John Figge, www.northwestgeology.com)

forms that comprises the parent material for our soils. So to understand the local soils and how they affect your garden plants, you need to understand glaciers.

A Few Words on Glaciers

Glaciers come in two basic varieties: puny alpine glaciers, like the ones you see on Mount Rainier, and massive continental glaciers that are big enough to eat whole states and bury good-sized mountains beneath their hulking masses. The last glacier that came through here was of the latter variety. It filled the Puget Lowland with ice so thick—3000 feet over Seattle—that it completely engulfed the Issaquah Alps, and that glacier was only a little lobe off the main ice sheet that came down from Canada and blanketed all of the northern United States.

Puny or massive, all glaciers start in the same way: when more snow falls in winter than melts in summer. Glacial ice bears little resemblance to the nice cubes from your fridge. First off, it moves of its own accord, grinding and growling

across the landscape. A glacier moves in two ways: It slides along its base, lubricated by the meltwater beneath it, and—more perplexingly—it moves “downhill” from areas of thick ice to thin via internal deformation. The ice in your drink is a brittle solid that can be crunched between your teeth, but if you put ice under enough pressure, say the weight of a few hundred feet of overlying snow and ice, it starts to behave like a plastic—bending, stretching and oozing rather than breaking. And by these means, glaciers, and all that they carry with them, travel.

And carry stuff with them glaciers certainly do; they are very messy things. Everything a glacier encounters, from tiny clay grains to giant boulders, gets taken up and incorporated into its mass. Several thousand feet of ice moving across the landscape makes for a powerful bulldozer. The glacial erosion occurs in several ways, and both the ice itself and the meltwater associated with it erode vast amounts of material. The meltwater under the various glaciers that came through here scoured out Puget Sound, Lake

Washington and Hood Canal—and deposited all that eroded material miles and miles away (an awe-inspiring thought!).

So to summarize, snow falls, and a glacier grows and goes on the move, grinding away at whatever is in its way, picking up all sorts of dirt and debris along with it. Meltwater streams, underneath and in front of the glacier, carve channels and carry large quantities of sand, silt and gravel. Eventually, the climate changes, with more ice melting in the summer than falling in the winter, and the glacier “recedes.” In fact, it just melts, and all of the dirt it has incorporated in its travels gets dumped, with small and large pieces being mixed together willy-nilly in a big ugly mess called glacial till—the crap under my sidewalk.

The Last Glaciation

The current Ice Age (known as the Pleistocene Glaciation) started about 2.6 million years ago and continues today—although we are now in what is called an interglacial period (an intermittent warm period), in which the ice retreats to its home bases in Greenland and Antarctica.

Scientists estimate that glaciers have covered the Seattle area seven times over the course of that 2.6 million years. Given the powerful bulldozing ability of glaciers, the arrival of a new one tends to obliterate any evidence of the last, so that most of what we see is from the very last advance of glacial ice. Around here, we call this the Vashon Stade of the Fraser Glaciation.

This last glacier started about 25,000 years ago in Canada and began moving south. During this time, more and more water became tied up on the continents in the form of ice, and the sea level fell. Puget Sound wasn't an ocean inlet but a lowland where streams coming off the Olympic and Cascade Mountains coalesced before heading out to sea through the Strait of Juan de Fuca. About 16,000 years ago, the ice sheet lumbering out of Canada blocked off the Strait, forcing all those rivers to back up into lakes. The sediments deposited in those quiet waters were fine and mucky silts and clays, which we now call Lawton Clay.

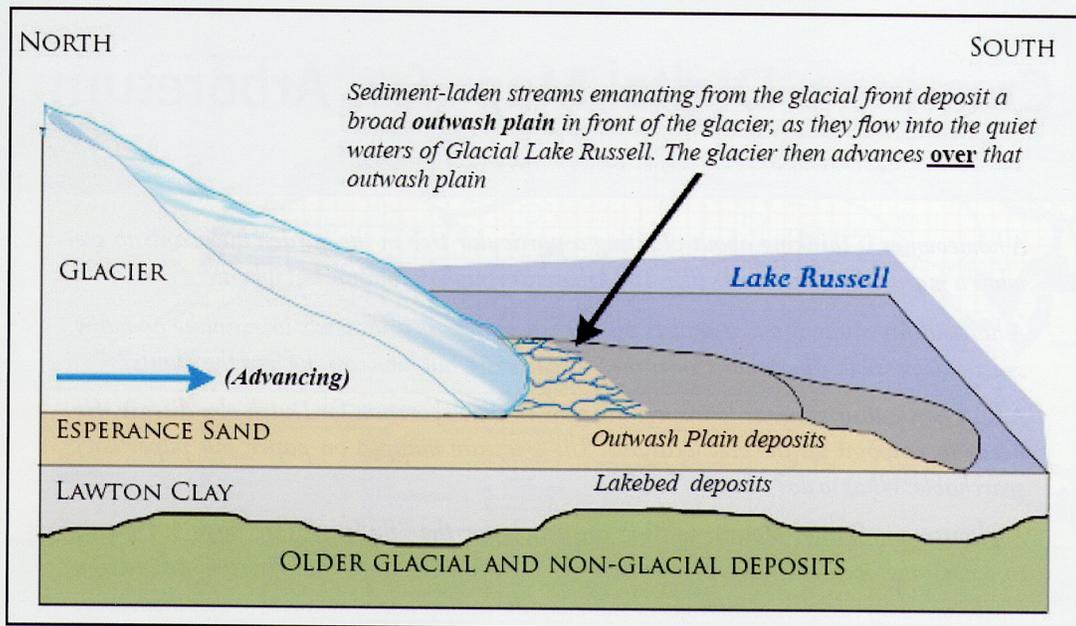
During the summers, meltwater flowed off the front of the glacier and formed a big, wet plain

made of sandy, river-like deposits. The amount of meltwater was substantial, so much so that the so-called outwash sands completely filled the Puget Lowland. As the glacier crept and slid its way south, these outwash sands, called the Esperance Sands, were deposited on top of the Lawton Clay. You can see both layers in the bluffs at Discovery Park, Seattle, and evidence of them in many other locations around the region. The layers can



ABOVE: About 16,000 years ago, the region's last glacier blocked off the Strait of Juan de Fuca and created a large lake. Rivers flowing into the lake deposited fine silts and clays that resulted in the Lawton Clay layer.

OPPOSITE: Outwash from the advancing glacier deposited a layer of sand (Esperance Sand) on the Lawton Clay. The glacier then moved over the sand and clay. When it melted, it deposited a layer of unsorted sediment (till) on top of the clay and sand. (Illustrations courtesy John Figge, www.northwestgeology.com.)



significantly affect local soil hydrology. Rainwater infiltrates readily through the Esperance Sands but stops when it hits the Lawton Clay and piles up. This pileup of water at the interface of these layers is the source of many of Seattle's seeps and landslides.

The glacier reached Seattle about 17,400 years ago, flowing over the sands and clays, compressing them under its great weight—making a whopping hardpan in areas—and kept on going, getting as far south as Tenino, Washington. Then it all began to melt, and the final landscape of Seattle began to take form. Three thousand feet of ice melted in the space of a 1000 years, and all the material it carried just got dumped, unsorted, giving us the Vashon Till—my crap, and possibly your crap, too. Some of that material got re-worked by a myriad of meltwater streams. Ravines were dug, like those seen around Carkeek Park. But most of these streambeds are dry now, the waters that carved them long gone. As the streams died, the sands, silts and gravels in them got left behind and became the parent material for some of our sandiest soils, which can be viewed either as our best-draining soils or our “drougthiest.”

Occasionally, these streams were blocked, and lakes formed with more silt and clay deposits. In some cases, large pieces of ice got stranded

and melted more slowly than the rest of the glacier, leaving holes called kettles, which became lakes—including everyone's favorite, Green Lake. Later, when life came back to the area, some of the lakes filled with organic debris, creating peat bogs like those found in Greenwood. On its southbound journey, the ice also sculpted many elongate, north-south running hills in the till—called drumlins—the hills that define Seattle's topography and make biking east-west in Seattle such a pain.

Collectively, the material left by the last glacier is poetically called the Vashon Drift. Geologically speaking, the Arboretum area contains almost a complete set of the Vashon Drift and the soils derived from them. Till, sand, silty-clay and peat: Those are the parents of the soil in which most of us garden. Great soil or crappy soil—it's all the glacier's fault. ☺

In the next issue—“Geology of the Arboretum, Part 2: How the Soils Affect the Plant Collections.”

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