Peter Sinks: Why the Rocks Change as You Walk Down

A short geology explainer

Peter Sinks, in Utah's Bear River Range east of Logan, is famous as one of the coldest places in the Lower 48 — but the same reason it holds record cold-air temperatures also explains its rocks. The basin has no valley outlet, so instead of draining downhill like a normal canyon, it traps cold air, rain, and — especially at this snowy, high-elevation site — melting snow in place. That trapped water is what has slowly carved the rock exposed in the walls of the sinks today.

Two Rock Layers, One Story

The rock around Peter Sinks belongs to two formations laid down as mud and lime on the floor of a shallow sea roughly half a billion years ago, during the Cambrian period. The Bloomington Formation — a mix of shale and thin limestone — was deposited on top of an older unit called the Blacksmith Dolomite, a thick, resistant carbonate rock. Because Bloomington sits on top, it caps the high ground around the sinks; it's what you're walking on coming in from the east near the top of the trail. As you descend into the basin you are walking down through progressively older rock, and at the deepest point of the sinks, the Blacksmith Dolomite is exposed. Older rock at the bottom and younger rock at the rim is exactly what you'd expect from an undisturbed sequence that has simply been cut into from above.

Which Formation Is Older

The Blacksmith Dolomite is the older of the two — it was deposited first and then buried under the younger Bloomington Formation. Both were later uplifted, along with the rest of the Bear River Range, by faulting tied to the same mountain-building, and later stretching (Basin-and-Range), forces that shaped the whole region.

How the Basin Was Carved: A Self-Reinforcing Process, Not a Cave Collapse

It's tempting to picture Peter Sinks the way most people picture a sinkhole: an underground cave whose roof suddenly gave way. Its shape argues against that. Peter Sinks is a broad, gently sloped double basin about half a mile across and 400–500 feet deep — proportions typical of a "solution doline," a depression formed by water dissolving carbonate rock gradually across a wide area. A "collapse doline," by contrast, forms where a cave passage's roof fails and drops a narrow, steep-walled pit into the void below — which is what nearby features like Main Drain and Nielson's Well actually are.

It's important to be clear that the basin did not form by dissolving evenly everywhere. If the whole surface dissolved at the same rate, the entire plateau would simply lower together and no bowl would ever appear. Instead, the process almost certainly began at a handful of naturally weaker, more fractured spots in the rock — most likely tied to the same faulting that built the Bear River Range, since rock along a fault is more broken up and lets water in more easily. Snowmelt and rain reaching those spots started dissolving them just a little faster than the surrounding rock.

From there, a self-reinforcing cycle took over. Once a spot became even slightly lower than its surroundings, it started collecting more water — both as visible flow across the surface and, just as important, as water seeping down through the fractured rock immediately beneath it. More water moving through that spot meant faster dissolution, which made it lower still, which drew in water from an even wider area around it, which dissolved it faster yet. Meanwhile, the higher ground between these growing low points shed its water into them rather than holding onto it, so it dissolved far more slowly and was left standing higher — becoming the slopes and rim seen today. The low point didn't simply sit under water longer in some passive sense; becoming low is what made it collect more water, which is what made it get lower still. That feedback loop, not uniform lowering, is why the basin is a bowl rather than the whole plateau having sunk evenly.

That same idea explains the gradual thinning noticeable in the Bloomington Formation while walking down into the sinks. The rock layer itself was the same thickness everywhere to begin with — it did not physically thin out across the landscape. What changes with position is how much of that original thickness has already been eaten away by erosion and dissolution: very little near the rim, nearly all of it near the center, where the feedback loop has had the most time and the most water to work with. Once the process cut deep enough at the center to reach the base of the Bloomington and expose the top of the Blacksmith Dolomite, there was likely a further boost: Blacksmith is a purer, more uniform carbonate than the shale-rich Bloomington above it, and pure carbonate rock dissolves considerably faster. So the deepest point of the sinks probably accelerated for two compounding reasons — it had already been collecting more water for longer, and once it reached Blacksmith, it was also dissolving a more soluble rock.

The slopes themselves likely did not keep getting steeper indefinitely. Once a slope is steep enough, gravity starts moving loose soil and rock downhill on its own — through slow creep and small slumps — at roughly the same pace dissolution would otherwise steepen it further. So the sides of the basin probably settled into a fairly stable angle early on and have mostly been retreating outward at about that angle ever since, shedding loose material down toward the center rather than growing ever steeper. That shed material likely makes up part of the sediment now covering the basin floor, which in turn helps the bottom hold water — and cold air — even more effectively, tying the geology back to the very reason Peter Sinks is famous in the first place.

The Short Version

Peter Sinks sits in a closed, fault-bounded basin with no drainage. The process that carved it was not uniform: snowmelt and rain concentrated in a handful of naturally weaker, more fractured spots — likely tied to the faulting that built the range — and wherever a spot became even slightly lower, it collected more water, dissolved faster, and grew lower still, in a self-reinforcing cycle, while the ground between those spots shed water instead of holding it and was left standing higher as the slopes and rim. That is why walking down into the sinks moves through progressively more eroded rock, cutting down through the younger Bloomington Formation until the older, more soluble Blacksmith Dolomite is exposed at the deepest point — a transition that likely sped the process up further once it was reached. It's a solution doline shaped by focused, self-reinforcing dissolution, not a uniform lowering and not a collapsed cave roof.