

'Ghost streams' sound supernatural, but their impact on your health is very real

Developers buried our streams. It's about time we exhume them.

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This series highlights the written work of scientists, engineers, analysts, and other experts. Have something to say? Email perspectives@popsci.com.



A stream in its natural habitat. Nick Cooper via Unsplash

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Across the country, buried beneath the pavement you walk on, an invisible network of waterways flows through the darkness. These are ghost streams, and they're haunting us.

In their former lives, they wound through natural landscapes above ground; it's only through decades of development that humanity has relegated them beneath the earth's surface, enclosing the waterways in tombs of concrete and iron. The effects, decades later, plague us. Without a natural habitat to snake through, these streams carry downstream an excessive amount of pollutants (like salt and sediment) and nutrients (like nitrogen and phosphorus) because they can't divest these materials into their surrounding environs.

Here's how ghost streams happen: Civilization grows near water sources, clustering around lakes, rivers, and springs that provide the resources required for drinking, bathing, and irrigating. As we industrialized drinking water infrastructure and outsourced water sources to larger, distant reservoirs and aquifers, most towns stopped using the smaller springs that originally drew them to a place. With that shift, many of the original freshwater sources go unused. Without relying on them for drinking water or irrigation, they become nothing but nuisances to development. If you want to build on a piece of land, the stream that threads through it has got to go. But streams are formidable obstacles; you can't just demolish them and move on. Water needs to flow, so when we construct on land traversed by a stream, we bury it.

The move isn't a recently devised trick. The western world has been moving streams underground since the Roman Empire. Between then and now, our stream burial technology has not undergone any revolutions, aside from separating stormwater and raw sewage and using different pipe materials.

Most people are not aware of the historic streams that have been buried—except for the curious few who wonder, for instance, why the street in downtown New York City is named “Canal.” In fact, we've buried streams all across the nation—in Los Angeles, D.C, and more. The U.S.'s Environmental Protection Agency estimates that we've buried 98 percent of the streams that once crossed through Baltimore's urban core.

Although we've buried these streams, we haven't put them to rest. They are still flowing, and still take in all the things we shed, spill, drop, and leak into our landscape. As rain runs over paved streets and sidewalks, it sweeps everything from the urban world directly into the nearest waterbody. Urban runoff makes its way to these hidden streams.

Unpiped, healthy streams naturally filter much of the water that flows into them. Smaller streams are mediators of human effluent: receiving the waste discharged from point sources (like industrial pipes and wastewater treatment plants) and from nonpoint sources (like runoff from streets and agricultural activities) and using tools like microbes, algae, rocks, and soil to slowly unload and transform excess nutrients and pollutants. Unwittingly tasked with filtering chemicals and solutes, natural streams become highly important to human health. And when we bury streams, we rob ourselves of our natural purifiers.

Streams typically teem with life: algae, fish, and invertebrates. A stream is home to microbes that require light, nutrients, and a natural stream bottom. These microorganisms are the power players that remove those excessive nutrients. But most ghost streams don't host much life at all. When we bury a stream underground, we cut it off from light and the stream bottom. Only nutrients remain, which are funneled downstream, mixing city runoff with fresh water in the nearest river.

"Nutrients" sound good, but they can wreak havoc in downstream waterbodies, polluting waterways, creating coastal dead zones, and feeding thick blooms of toxic cyanobacteria.

Luckily, towns are beginning to acknowledge the importance of these buried streams in an effort to reduce the terrors of urban runoff. Simply letting locals know a stream exists beneath them, and that the stream receives everything, untreated, that goes down the drain, encourages people to keep their waste out of the secret streams.

For example, small frog statues adorn city drains in Blacksburg, Virginia, marking the drains directly above the local ghost stream. It's a callback to the Ancient Romans, who marked their buried streams with shrines to "Cloaca Maxima" or the sewer goddess. Baltimore stencils its storm drains, and Richmond, Virginia and Dayton, Ohio want to do the same using the work of local artists. Entry points to waterways are embellished with paintings of fish, octopuses, and otters encircled by cautionary reminders like "all water drains to the sea" and "only rain should go down the drain." Other storm drain murals are decorated with landscape paintings of scenic wildlife, images of kelp with plastic and litter for companions, or paintings of fish where grated drains act as mouths.

Some places are going further, ripping up pavement, shattering pipes, and hammering away the concrete to exhume ghost streams. Daylighting, as the procedure is called, opens the streams up to the sun and restores the adjacent land connection. This begins the process of healing, re-growing vegetation, and encouraging microbes and algae to come back. It's great, but unburying a stream is expensive and requires strong community backing, and community support for daylighting a stream can't be mustered if residents aren't aware of the buried stream itself. Art is a great first step.

By recognizing ghost streams and getting locals engaged, we can work toward healing the waterways by limiting the pollutants poured into them, and even eventually unearthing them from the ground.