

Impervious Surfaces: How Modern Cities Disrupt Natural Ecosystems.

An impervious surface is any surface on the earth that rainwater cannot penetrate and soak into native soil, thus not being available for vegetation or to replenish aquifers. Basically, we are talking about roofs of all kinds, and concrete and asphalt pavements for roads and parking lots.

The only natural impervious surfaces are granite and similar solid rock surfaces like mountain peaks and places like Enchanted Rock.

Before European man began moving into the Hill Country, there were no “artificial” impervious surfaces, and even though the early settlers erected small houses with roofs, the percentages of these surfaces were a tiny fraction of the surrounding landscape.

But our modern cities and towns have greatly changed the natural processes of rainfall soaking into the ground and providing base-flow to our rivers and streams. What we have now is large areas with significant amounts, sometimes the majority, of the area are now covered with impervious surfaces—roofs of homes and businesses, parking lots and roads.

The result of all of this is that in rainfall events, most of the water doesn't find its way into the soil, but rather runs off roofs and parking lots and roads and into the storm sewer system and immediately into the nearest river or stream. But if the river can't hold all of the water in such a short time, local flooding may occur as well as significant erosion of stream banks.

Remember the terrible flooding that happened to Houston with hurricane Harvey and the record-breaking amount of rain in just a few days? If exactly the same storm had hit Houston 30 years ago, with the same amount of rainfall in the same amount of time, there would have been very much less flooding, maybe none. What is the difference?

As Houston was growing, more and more area was “developed” and more and more impervious surface was installed so instead of all that excess water running off and flooding low areas, it could have soaked into the ground in the ranch and farmland that used to exist in that area.

To quote from “Texas Water: Exploring Water and Watersheds,” by Johnnie Smith, “there is a direct relationship between urbanization and the number of bankfull flows annually...A watershed with 25% impervious surfaces is expected to experience a 100-year rainfall event every 5 years...At 65% imperviousness, it is predicted to occur annually.” And as cities grow not only the percentage of impervious surfaces increase but the absolute amount of these areas also increases

Impervious surfaces have consequences other than exacerbating flooding. Because less rainfall reaches the ground in a watershed with impervious surfaces than it would

have in the absence of impervious surfaces, there is less water in the local water table to help maintain the base flow of creeks and rivers, and some water wells could be affected because the aquifers are not recharged. Furthermore, erosion can be a serious problem in these high-flow events that can damage bridges, roadways, utilities. And of course, there are always people trying to cross flooded roadways, some of whom become stranded and require help or in some cases, sadly, lose their lives trying.

Another problem is that storm water contains a lot of pollutants. Every fluid that leaks from all of our cars and drips onto a road, driveway or parking lot, flows into the storm sewer and into our rivers and eventually finds its way into the Gulf. All of those things can be highly detrimental to all sorts of aquatic organisms. Runoff from our lawns that enters the storm water also carries all the pesticides and herbicides that were applied by landowners to their yards.

Unfortunately, once our cities are built with the roads and parking lots in place, the storm sewer systems are also in place, so there is not a lot we can do to reduce or mitigate the flow of storm water in a rainstorm. We can, however, take the effects of impervious surfaces into account with new construction, providing drainage basins or impoundments at critical points.

There are also ways for new parking lots to be made of bricks that are designed to allow water to penetrate into the soil below.

Capturing rainwater off of roofs prevents runoff and allows the water to be used either inside of houses and/or on lawns and gardens. This not only reduces storm runoff but it conserves precious aquifer water.

Until next time...

Jim Stanley is a Texas Master Naturalist and the author of the books "Hill Country Ecology," "Hill Country Landowner's Guide" and "A Beginner's Handbook for Rural Texas Landowners." He can be reached at jstmn@ktc.com. Previous columns can be seen at www.hillcountrynaturalist.org.