Parking Spaces Outnumber Drivers 3 To 1, Drive Pollution And Warming

Science Daily — From suburban driveways to the sprawling lots that spring up around big retailers, Americans devote lots of space to parking spaces – a growing land-use trend that plays a role in heating up urban areas and adding to water pollution, according to a recent study.

Purdue University researchers surveyed the total area devoted to parking in a midsize Midwestern county and found that parking spaces outnumbered resident drivers 3-to-1 and outnumbered resident families 11-to-1. The researchers found the total parking area to be larger than 1,000 football fields, or covering more than two square miles.

"Even I was surprised by these numbers," said Bryan Pijanowski, the associate professor of forestry and natural resources who led the study in Purdue's home county of Tippecanoe. "I can't help but wonder: Do we need this much parking space?"

Pijanowski said that his results are cause for concern, in part, because parking lots present environmental and economic problems. They are, for instance, a major source of water pollution, he said.

Tippecanoe County parking lots turn over about 1,000 pounds of heavy metal runoff annually, said Purdue professor Bernard Engel, who used a computer model to estimate changes in water-borne runoff caused by land-use changes. Engel, head of the Department of Agricultural and Biological Engineering, said lots are troublesome because pollutants collect on their non-absorbent surfaces and are then easily carried away by rain.

"The problem with parking lots is that they accumulate a lot of pollutants – oil, grease, heavy metals and sediment – that cannot be absorbed by the impervious surface," Engel said. "Rain then flushes these contaminants into rivers and lakes."

Heavy metals accumulate on parking lots from car batteries and even from airborne fumes, a phenomenon called dry deposition. Also, since rainfall cannot penetrate parking lots, they generate large amounts of flowing water, worsening flooding and erosion – and water pollution, Engel said.

Parking lots also help add to the "urban heat island effect," which can raise local temperatures 2 to 3 degrees Celsius, according to Indiana state climatologist Dev
Niyogi.
"Urban areas have a higher capacity to absorb radiation from the sun than surrounding areas, and these areas become warmer," Niyogi said. "This effect could be even more dramatic in much of the Midwest because there are many urban areas immediately surrounded by cooler rural areas."

Pijanowski said his study has relevance outside of Tippecanoe County because his findings typify a troubling trend he’s observed and studied: Generally, Americans pave an increasing percentage of land each year for their cars and trucks.

While parking spaces are necessary, Pijanowski said that businesses could be more creative about utilizing combined-use or shared parking lots, thereby saving construction and property costs while minimizing land use. This approach might benefit large churches and "big-box" retailers, which often feature parking lots that take up more than twice the area of their buildings, he said.

"Parking lots at big-box stores and mega-churches are rarely filled," Pijanowski said. A different approach to development planning could mitigate the monetary and environmental costs associated with parking areas, he said.

"In many areas of the world, particularly Europe, cities were planned prior to automobiles, and many locations are typically within walking distance," Pijanowski said. "This is just one different way to plan that has certain advantages."

Pijanowski counted 355,000 parking spaces in Tippecanoe County, home to about 155,000 residents. Farmers could produce 250,000 bushels of corn in the same space taken up by county parking lots, he said.

The county's parking lots also produce 1,000 times the amount of heavy metal runoff and 25 times the total runoff that the same area of agricultural land would produce, Engel said. The computer model, a type of "long-term impact assessment model," calculated predicted changes in runoff and compared them with runoff levels from land in agricultural production, which generally produces less runoff because soil is better able to absorb rainfall and contaminants than pavement.

Although Purdue University draws non-resident student drivers and visitors to Tippecanoe County, Pijanowski said the effect is negligible on his calculated ratios of lots to drivers and is typical of the manner in which midsized counties often attract non-residents and their cars for various reasons.

Pijanowski conducted his survey using digitalized aerial images of Tippecanoe County taken in 2005, which he then analyzed to count the number of total parking spaces and the land area they consume. Students Amélie Davis and Kimberly Robinson helped to collect and analyze data.

He presented the results of his work in May at a conference of land-use experts in the Netherlands. This survey is the first in a series aimed at assessing the automobile's impact on land-use patterns, Pijanowski said.

Pijanowski counted parking lots at businesses, Purdue University and other public properties. Since he didn't include lots on private property or count multiple levels of parking garages, he regards his calculation of parking area and spaces as a significant underestimate.

"People can help by first realizing that our land is not unlimited and that we need to use it prudently," Pijanowski said. "They can seek a lifestyle that requires less automobile use. They can express their opinions that parking lots do not have to be as large as they are, attend planning meetings and help guide others to act."

Note: This story has been adapted from a news release issued by Purdue University.

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