

in brief...

Urban sprawl

New research by **Henry Overman** and colleagues provides a detailed picture of how land is used in US cities – and challenges conventional wisdom about urban sprawl.

Urban sprawl is widely regarded as an important environmental and social problem, particularly in the United States. But much of the debate is based on speculation: until now, the data to conduct detailed and systematic measurement of how and where land is converted to urban use have simply not been available. Our research fills that gap by merging high-altitude photos from 1976 with satellite images from 1992 to create a grid of 8.7 billion 30-metre by 30-metre cells that tracks the evolution of land use across the whole of the continental United States.

These new high-resolution data make it possible to observe the amount of open space in the neighbourhood of every house in every US city. Since there is more open space around a house that is far from its neighbours, development is more scattered as this quantity of open space increases. Thus, we can measure urban sprawl by calculating the average amount of open space in the neighbourhood of a house in each city.

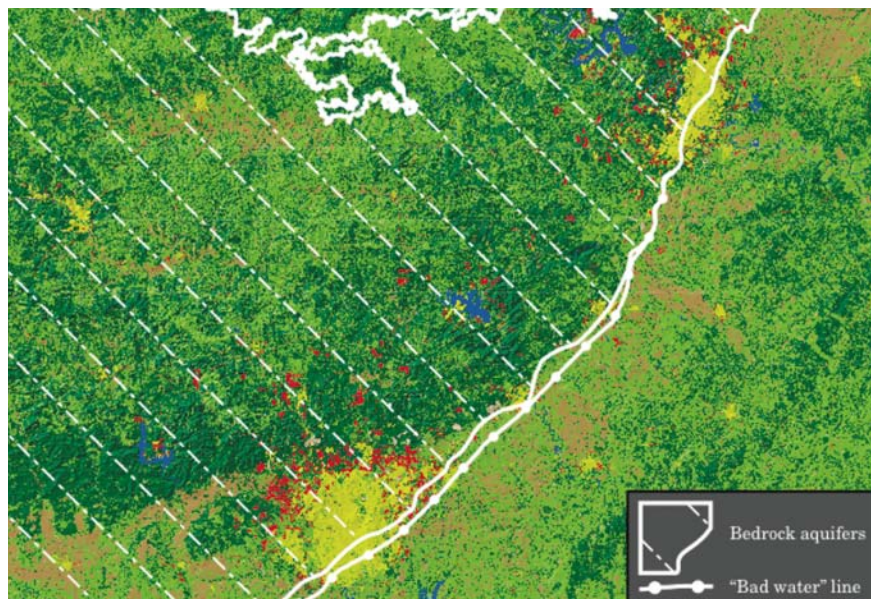
So is urban sprawl really increasing? In fact, we find that residential development in 1992 is no more scattered than development was in 1976. The proportion of open space in the square kilometre of land surrounding the average residential development was 42% in 1976 compared with 43% in 1992. While a substantial amount of scattered residential development was built between 1976 and 1992, overall residential development did not become any more biased towards such sprawling areas.

Of course, any one household might have seen a great deal of change over this period. But if we zoom out and look at the city from a distance, we see little change, at least in terms of the proportions of sprawling and compact development. The new city is just like an enlarged version of the old city.

We also investigate why some cities are more sprawling than others, and find that a city's climate, topography and access to groundwater account for 25% of the variation. For example, when the climate is temperate, people spread

Figure 1 (this page):
Urban land and aquifers
in San Antonio and
Austin, Texas

Figure 2 (opposite page):
Urban land and
incorporated places
in St. Louis, Missouri



Roads have no impact on sprawl;
climate, topography and access to
groundwater do

Overall, cities are not sprawling more than they used to: the new city is just like an enlarged version of the old city

out to have more space to enjoy the weather. Similarly, hilly places see more scattered development as people avoid the costs of building on hillsides. But mountains act as a barrier and lead to more compact development.

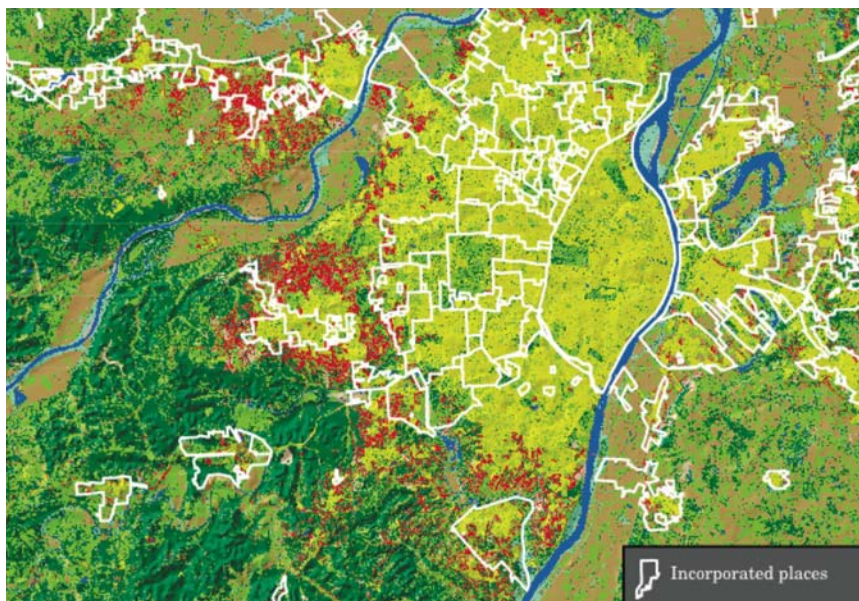
Places with easy access to groundwater also see more scattered development since people can supply remote houses with water by drilling inexpensive wells rather than paying for water lines. The presence of aquifers is particularly important (as illustrated in Figure 1, which shows the relationship between aquifers and sprawl in San Antonio and Austin, Texas). This implies that controlling access to groundwater is a way to control whether development sprawls or not.

Roads, in contrast, have no impact on development patterns, despite commonly held beliefs to the contrary. Taking various measures of road density – miles of road per area, average distance to a road and distance to an interstate exit – we find no relationship with the scatteredness of development. This suggests that the road

network tends to follow development patterns rather than vice versa.

The number of municipalities in a metropolitan area also has no effect on development patterns. But development near cities is less scattered if it occurs in a municipality as opposed to an unincorporated area of a county (as Figure 2 – a map of St. Louis, Missouri – depicts). This suggests that people may be moving just beyond municipal boundaries to avoid more stringent municipal regulations.

One of the common complaints about urban sprawl is that as development spreads, municipal services such as roads, sewers, police and fire protection are more expensive. It turns out that this concern is well founded. Development in municipalities that receive larger government subsidies is, on average, more scattered. This suggests that when local taxpayers are held accountable for infrastructure costs, they respond by insisting on patterns of development that require less infrastructure spending.



Urban land circa 1976
 Urban land built 1976-92
 Water
 Bare rock and sand

Forest
 Range and grassland
 Agricultural land
 Wetlands

0 5 Kilometers
0 5 Miles

This article summarises 'Causes of Sprawl: A Portrait from Space' by Marcy Burchfield, Henry Overman, Diego Puga and Matthew Turner, *Quarterly Journal of Economics* 121:2 (May 2006). The photographs are from page 598, ©2006 by the President and Fellows of Harvard College and the Massachusetts Institute of Technology.

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