HOUSING ENGAGEMENT & RESEARCH INITIATIVE

University of Kentucky

AN OVERVIEW OF CHANGES IN LAND COVER AND DEVELOPED LAND IN KENTUCKY COUNTIES FROM 2001 - 2021

By Dr. Lucas Taulbee

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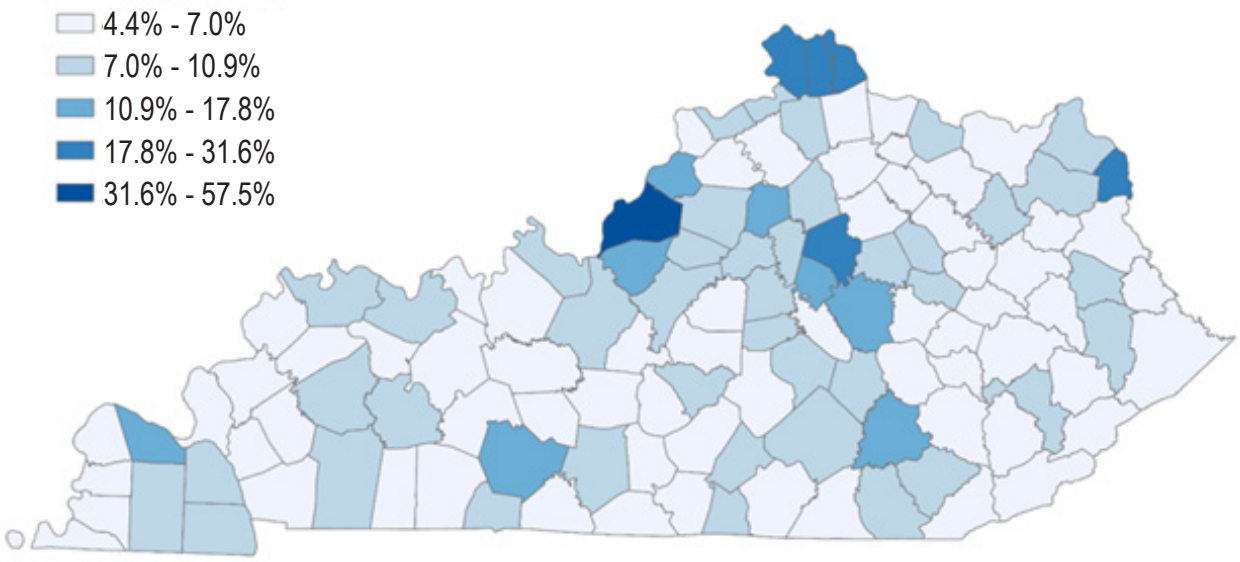
In recent years, challenges to provide housing in both urban and rural markets have been of heightened concern to residents, business leaders, and policymakers. A key input in the production of housing is land. Without suitable land, it is practically impossible to produce housing. There are both policy restrictions and natural restrictions to the development of suitable land. In urban areas, zoning and planning are central to the discussion of housing and land. In rural areas, a bigger concern is how to make land "build-ready" which includes making electricity, water/sewage, and transportation infrastructure accessible. In this brief, data from the U.S. Geological Survey's (USGS) National Land Cover Database (NLCD) are used to describe how land cover and developed land have changed in Kentucky counties over the last two decades.

The NLCD is a product of USGS and the Multi-Resolution Land Characteristics (MRLC) Consortium and provides land cover information for the United States with an updated data release every two to three years. This brief summarizes information on land cover in Kentucky counties from the 2001, 2004, 2006, 2008, 2011, 2013, 2016, 2019, and 2021 NLCD releases. The NLCD is constructed using satellite and aerial imagery and is a useful tool for understanding the types of land that are present in an area.

The NLCD contains the following land cover designations. See appendix for definitions.

- Developed
  - High Intensity
  - Medium Intensity
  - Low Intensity
  - Open Space
- Agricultural
  - Cultivated Crops
  - Pasture/Hay
- Forest
  - Deciduous Forest
  - Evergreen Forest
  - Mixed Forest
- Other
  - Grassland
  - Scrub/Shrub
  - Barren Land
- Wetland
  - Woody Wetland
  - Emergent Herbaceous Wetland
- Open Water

Figure 1. Developed Land as a Percentage of Total Area, 2021

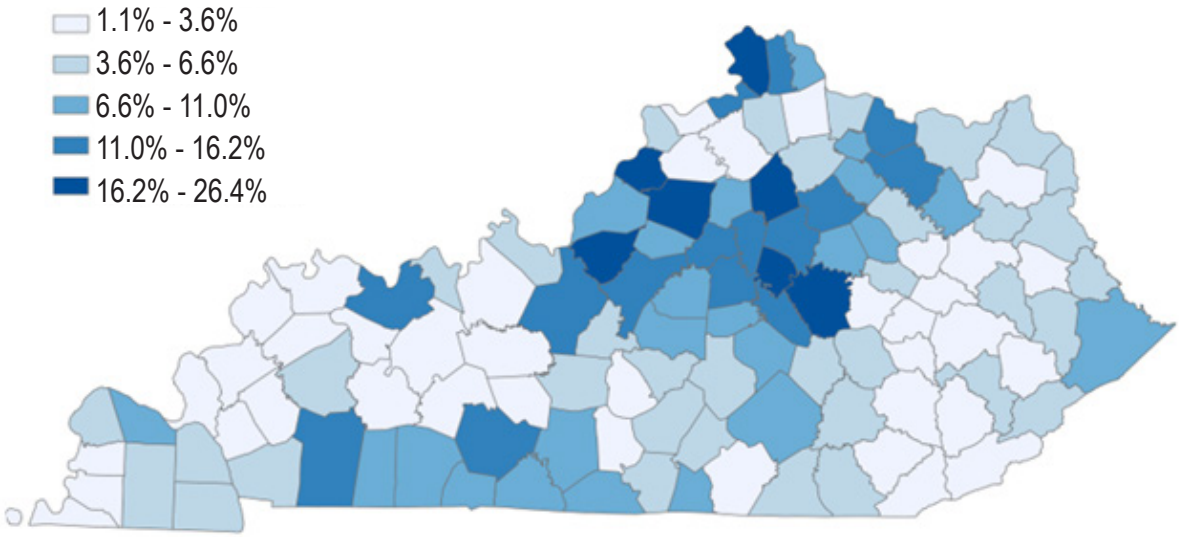


This figure maps developed land as a percentage of total area by county for Kentucky in 2021. The percentages range from about 4.4% in Breathitt County to about 57.5% in Jefferson County. Only Jefferson (57.5%), Fayette (31.3%), and Kenton County (30.6%) have developed land that accounts for more than a quarter of total area. Eleven counties have developed land that accounts for less than 5% of total area.

In 2021, the amount of developed land as a percentage of total area varied quite a bit across Kentucky counties as illustrated in Figure 1. The counties with the highest share of developed land primarily lie in the state's largest metropolitan areas such as Jefferson County (Louisville), Fayette County (Lexington), and Kenton County (Cincinnati area). Many of the least developed counties are in the eastern and south-central regions of the state. The percentage of developed land as a proportion of total area is important as a measure because it informs the potential challenges a county might face in identifying land for housing. In densely developed counties, the challenge might be how to effectively zone, plan, and incentivize redevelopment for housing whereas less developed counties might face challenges in finding cost-effective ways to develop previously undeveloped land.

Another measure to consider is the change in developed land over time. Figure 2 (next page) summarizes the percentage change in developed land area from 2001 to 2021 for Kentucky counties. Counties in the Louisville, Lexington, and Cincinnati metro areas saw the largest proportional increases in developed land over these two decades. Notably, Jefferson and Fayette Counties had proportionally less growth in developed land compared to nearby counties such as Bullitt, Shelby, Oldham and Jessamine, Madison, and Scott. This suggests that suburban counties in Kentucky have been developing proportionally more than urban and rural counties. The smallest changes in developed land from 2001 through 2021 are observed in the eastern and western parts of the state.

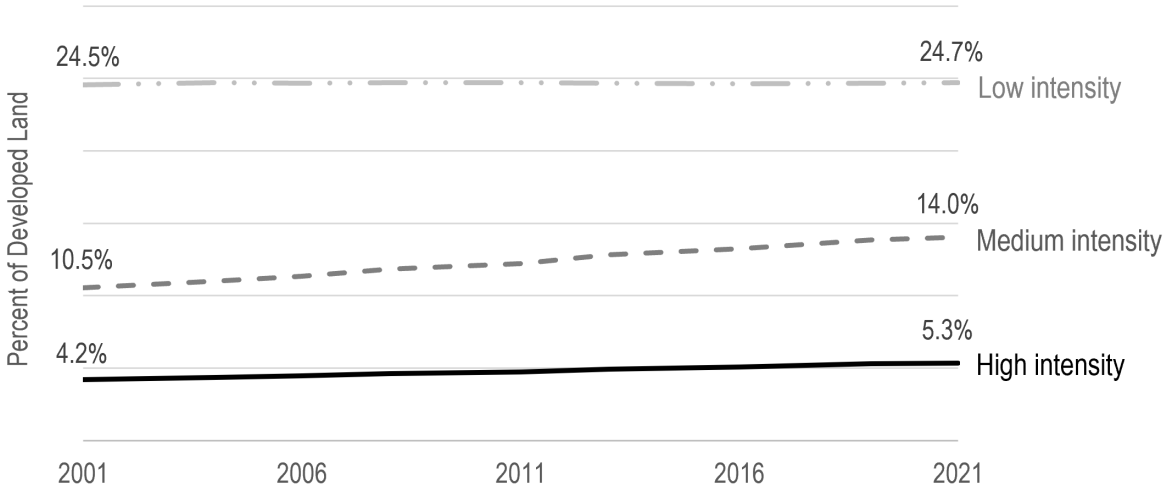
Figure 2. Percent Change in Developed Land, 2001 – 2021



This figure plots the percentage change in developed land area by county from 2001 to 2021. The percentage change ranges from 1.1% in Edmonson County to 26.4% in Jessamine County. Notably, there are no counties in which the area of developed land decreased. Jessamine County (26.4%) and Scott County (23.9%) in the Lexington-Fayette metro area, as well as Boone County (23.5%) in the Cincinnati metro area had the largest proportional increases in developed land. Nine counties had increases of less than 2%.

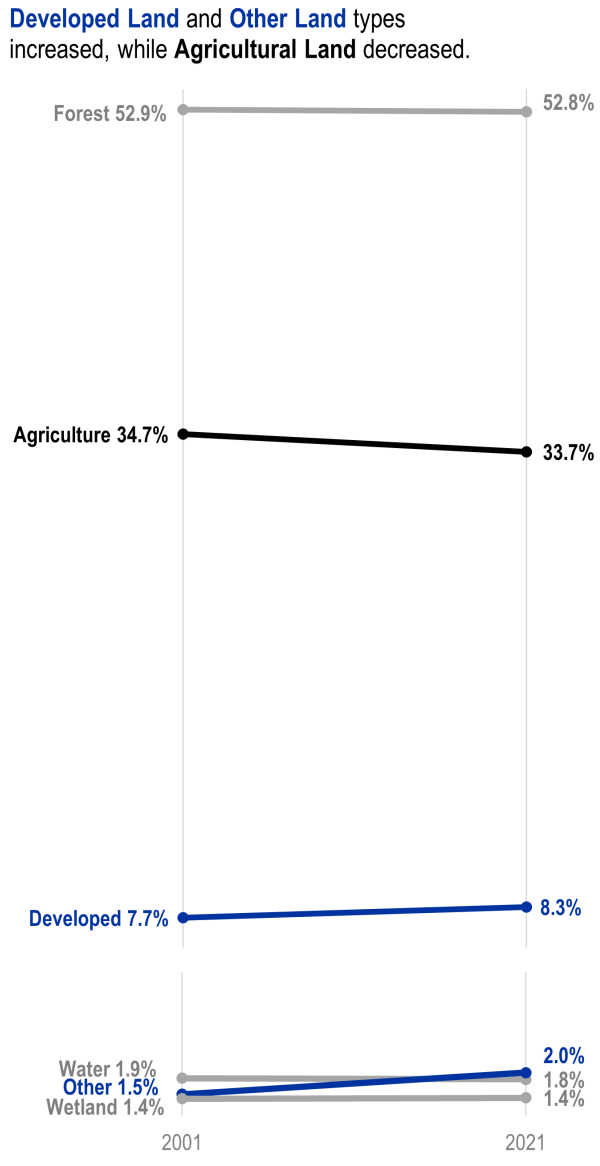
Increases in the share of developed land over time suggest growth and could be a sign that these counties are more responsive to demand for land. Another way to view increases in developed land is that future development can become more costly as the land that is most suitable for development has already been developed. For counties with small changes in developed land over time, it could either suggest that developing land might be cost prohibitive or that there is simply very little land suitable for development. Each county may experience vastly different challenges.

Figure 3. Developed Land Types as a Percentage of Developed Land, 2001 through 2021.



In addition to measures of developed land as a share of land area and changes in developed land over time, it is also informative to consider subtypes of developed land. As noted, the NLCD classifies developed land as either high intensity, medium intensity, low intensity, or open space.[1] Figure 3 (previous page) depicts how each subtype of developed land has changed over time on average as a percentage of all developed land. The figure illustrates a modest steady decline in developed open space and a modest steady increase in medium intensity development since 2001. This suggests that most of the changes in developed land cover over time have likely been due to medium intensity development, perhaps at the expense of open space development.

Figure 4. Land Types as a Percentage of Total Area, 2001 and 2021, for the Average Kentucky County.

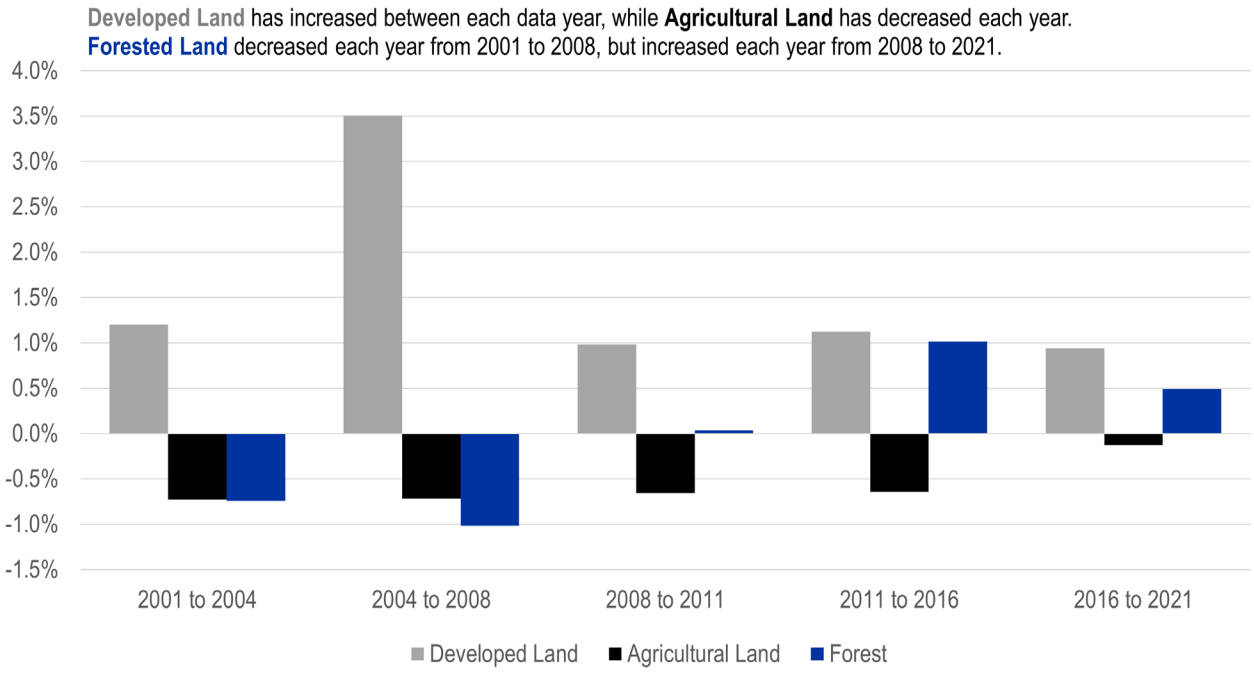


In addition to looking at developed land in isolation, it is also useful to consider how other land cover types have changed over time in conjunction with changes in development. Figure 4 (at left) illustrates the main types of land cover as a percentage of total area in 2001 and in 2021. As shown, the largest changes in county land cover on average have been a modest increase in developed land and a modest decrease in agricultural land as a share of total area. This might suggest that the largest share of land being developed is land that was previously used for agricultural purposes. Figure 5 (next page) shows changes in the three largest categories of land cover: forests, agricultural land, and developed land, from year to year. The figure contributes some graphical evidence of a negative correlation between developed land and agricultural land. The large jump in development from 2004 to 2006 can likely be attributed to high rates of housing starts during that time.

In conclusion, the NLCD demonstrates that developed land as a share of total area is most concentrated in the most urban counties, that proportional growth in developed land area has tended to be most concentrated in urban counties and even more so in nearby suburban counties, and that the primary type of land cover that is lost to development is likely agricultural land. This information highlights the unique obstacles that counties throughout Kentucky face to supplying suitable land for building.

[1] Open space development is a type of development in which land is cleared or otherwise modified from its original state, but open space is preserved. Parks are an example.

Figure 5. Changes in Land Types, 2001 to 2021.



REFERENCES

United States Geological Survey. National Land Cover Database. Accessed October 2024 at https://www.usgs.gov/centers/eros/science/national-land-cover-database#data

Multi-Resolution Land Characteristics Consortium. National Land Cover Data Viewer. Accessed October 2024 at https://www.mrlc.gov/eva/

APPENDIX

Summary of NLCD Definitions

Link to full NLCD definitions: https://www.mrlc.gov/data/legends/national-land-cover-database-class-legend-and-description

Developed: Land consisting of constructed materials and impervious surfaces.

- *High Intensity:* Highly developed residential, commercial, and/or industrial areas in which impervious surfaces (typically artificial surfaces constructed with pavement or other hard materials that prevent water was soaking into the ground) account for 80% to 100% of total land cover.
- *Medium Intensity:* Developed areas, often residential, with a mixture of constructed materials and vegetation in which impervious surfaces account for 50% to 79% of total land cover.
- *Low Intensity:* Developed areas, commonly residential, with a mixture of constructed materials and vegetation in which impervious surfaces account for 20% to 49% of total land cover.
- *Open Space:* Developed areas such as large-lot residential, parks, golf courses, etc. with some constructed materials but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total land cover in these spaces.

Agricultural: Land primarily used for agricultural purposes.

- *Cultivated Crops*: Areas used for production of annual crops (corn, soybeans, vegetables, tobacco, cotton, etc.) and/or perennial woody crops (orchards, vineyards, etc.). Crop vegetation accounts for greater than 20% of total vegetation. This includes all land being actively tilled.
- *Pasture/Hay*: Areas consisting of grasses and/or legumes planted for livestock grazing or production of seed/hay crops. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

Forest: Areas in which trees greater than 5 meters tall account for greater than 20% of total vegetation cover.

- *Deciduous Forest:* Forest areas in which more than 75% of the tree species shed foliage simultaneously in response to seasonal change.
- *Evergreen Forest:* Forest areas in which more than 75% of the tree species maintain their leaves all year.
- *Mixed Forest:* Forests in which neither deciduous or evergreen species are greater than 75% of total tree cover.

Other

- *Grassland:* Areas primarily containing graminoid or herbaceous vegetation greater than 80% of total vegetation. Not subject to intensive management such as tilling.
- *Scrub/Shrub:* Areas in which shrubs less than 5 meters tall account for greater than 20% of total vegetation.
- *Barren Land:* Areas primarily consisting of accumulations of earthen material such as bedrock, strip mines, gravel pits etc. and in which vegetation accounts for less than 15% of total land cover.

Wetland: Areas in which the soil or substrate is periodically saturated or covered with water.

- *Woody Wetland:* Wetlands in which forest or shrubland vegetation accounts for greater than 20% of vegetative cover.
- *Emergent Herbaceous Wetland:* Wetlands in which perennial herbaceous vegetation accounts for greater than 80% of vegetative cover.

Open Water: Areas of open water, typically with less than 25% cover of vegetation or soil.