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Agricultural Land Lost to Development in the Midwest

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Conversion of agricultural land to developed land during the 21st Century in eight Midwestern states is examined. This loss of agricultural land to development is a long-standing topic of discussion at the national and state level. Using what is likely the best available data set, we find that development accounted for 55% of the 1.6 million acre loss of agricultural land in these states during the 21st Century. Thus, while urban expansion is important, loss of agricultural land is more than development. Within the context of conversion to development, the role of large urban areas is paramount as 81% of agricultural land lost to development in the eight states occurred within Metropolitan Statistical Areas (MSAs). If a desire exists to reduce the loss of agricultural land to development, expansion of large urban areas must be addressed.

Data Sources

The National Land Cover Database (NLCD), produced by the Multi-Resolution Land Characteristics (MRLC) consortium, has leading-edge capabilities for assessing and projecting changes in land cover. The current analysis uses two satellite images and other supplementary cartographic datasets to analyze land use change from 2001 to 2021 in the Midwestern states of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The analysis period is the earliest to the latest years in the dataset. A wide variety of land conversions can be studied. In this article, we focus solely on the conversion of agricultural to developed land. Data Note 1 contains a detailed description of the definitions of these land categories.

Agricultural Land Lost to Development by Midwestern State

According to NLCD images from 2001 and 2021, agricultural land in the eight Midwestern states decreased from 150,312,467 acres in 2001 to 148,716,812 acres in 2021, a total decline of 1,595,655 acres (1.06%) (Table 1). Of the agricultural land lost, 877,386 acres (55% of 1,595,655) were converted

into developed land, likely due to urbanization, infrastructure expansion, or other development activities. Other agricultural land losses included conversion to forest, barren land, open water, and grassland.

Conversion to development was most important in Iowa. Development accounted for 90% of the loss of agricultural land in Iowa between 2001 and 2021 (see Table 1). Conversion to development accounted for the smallest of agricultural land loss in Wisconsin, Ohio, and Missouri. Development's share of total agricultural land lost was 56%, 48%, and 26%, respectively. When measured as number of acres, Illinois had the highest amount of agricultural land lost to development (155,653 acres), followed by Indiana (133,243 acres) and Wisconsin (128,679 acres). Michigan, Missouri, and Iowa lost the least number of agricultural acres to development at 52,629, 85,424, and 87,592, respectively.

Table 1: Agricultural land lost to development in Midwestern states

State	Ag land in 2001 (acres)	Ag land in 2021 (acres)	Ag land lost to development (acres)	Ag land lost to development (%)
Illinois	25,100,583	24,856,641	155,653	64%
Indiana	14,129,704	13,923,607	133,243	65%
Iowa	28,964,704	28,867,001	87,592	90%
Michigan	9,460,180	9,398,841	52,629	86%
Minnesota	24,012,459	23,845,969	105,678	63%
Missouri	22,863,549	22,541,050	85,424	26%
Ohio	13,115,911	12,847,481	128,486	48%
Wisconsin	12,665,377	12,436,222	128,679	56%
Total	**150,312,467**	**148,716,812**	**877,386**	**55%**

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Agricultural land lost to development by Metropolitan Statistical Areas (MSAs)

To help understand the dynamics of the agricultural land use change and aid in regional planning and development, an analysis was carried out at the Metropolitan Statistical Area (MSA) level. The Office of Management and Budget (OMB) defines an MSA as a geographical region consisting of a core city with "a population of at least 50,000" and maintaining strong economic and social interactions between the core city and the surrounding communities. The eight Midwestern states have 85 MSAs in total.

Of the agricultural land in the Midwestern states lost to development over the last two decades, 81% has occurred within MSAs. The share was highest in Illinois (89%) (Figure 1). Indiana, Michigan, Minnesota, and Wisconsin also lost over 80% of their agricultural land to development within MSAs. The MSA share was lowest in Iowa at 69%. The share for both Missouri and Ohio was 77%.

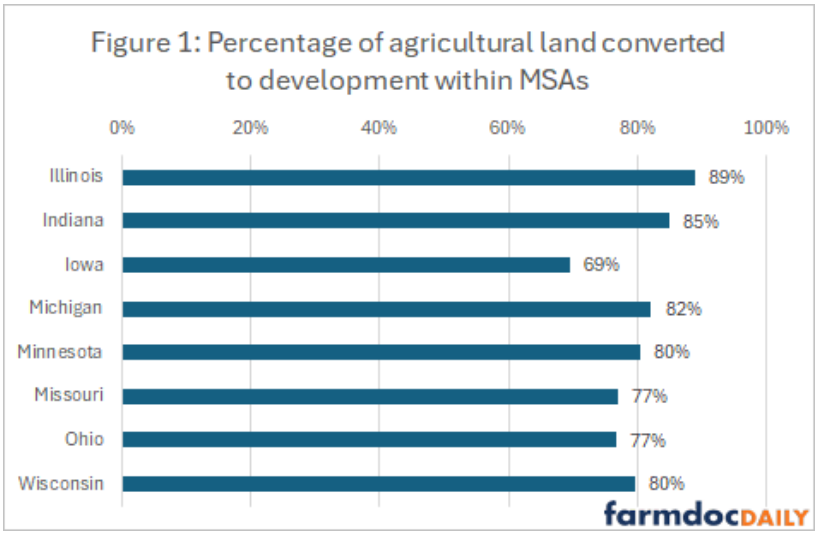

Table 2 lists for each state its three MSAs in which the most agricultural land was converted into developed land within that state. Among the 24 MSAs, the highest number of acres converted from agricultural to developed land was the Chicago-Naperville-Elgin MSA, with 92,673 acres converted. This MSA spans the northern part of Illinois, parts of Indiana, and southeastern Wisconsin (see Figure 2). The MSA with the second highest loss of agricultural land to development was the Minnesota MSA of Minneapolis-St. Paul-Bloomington at 65,754 acres, followed by the Indiana MSA of Indianapolis-Carmel-Anderson MSA at 61,919 acres.

Table 2: Agricultural land lost to development in Midwestern states (top three contributing MSAs)

State	MSA	Ag land in 2001 (acres)	Ag land in 2021 (acres)	Ag land lost to development (acres)
	Chicago-Naperville-Elgin, IL-IN-WI	1,421,876	1,321,317	92,673
Illinois	St. Louis, MO-IL	1,527,979	1,506,852	15,740
	Rockford, IL	293,672	284,102	8,225
	Indianapolis-Carmel-Anderson, IN	1,534,636	1,465,322	61,919
Indiana	Chicago-Naperville-Elgin, IL-IN-WI	718,982	705,984	11,895
	Fort Wayne, IN	521,610	509,235	10,145
	Ames, IA	277,987	274,509	31,682
Iowa	Cedar Rapids, IA	915,611	909,241	6,556
	Davenport-Moline-Rock Island, IA-IL	200,375	196,261	4,730
	Detroit-Warren-Dearborn, MI	646,226	627,700	12,787
Michigan	Grand Rapids-Wyoming, MI	676,600	664,037	8,394
	Lansing-East Lansing, MI	597,571	591,149	4,200
	Minneapolis-St. Paul-Bloomington	1,839,512	1,753,049	65,764
Minnesota	St. Cloud, MN	718,280	709,826	7,114
	Rochester, MN	1,010,006	1,006,297	5,239
	Kansas City, MO-KS	2,003,908	1,967,295	25,798
Missouri	St. Louis, MO-IL	718,030	689,012	17,528
	Springfield, MO	932,504	911,017	8,511
	Columbus, OH	1,311,206	1,309,323	37,770
Ohio	Cincinnati, OH-KY-IN	503,191	479,901	16,557
	Cleveland-Elyria, OH	330,190	313,270	12,037
	Milwaukee-Waukesha-West Allis, WI	316,447	294,446	22,403
Wisconsin	Madison, WI	1,220,966	1,195,279	18,184
	Appleton, WI	354,324	342,966	10,739

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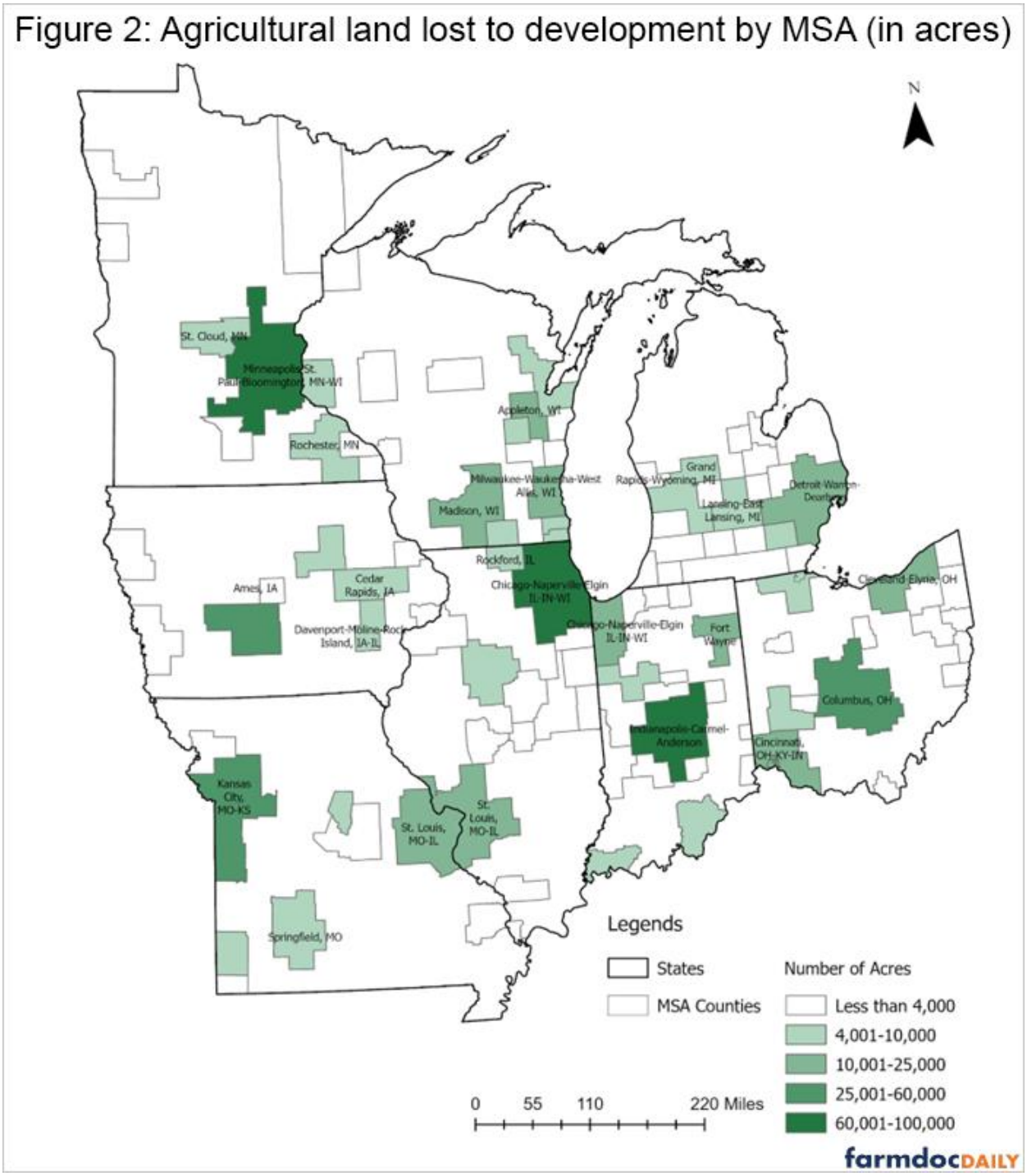
Figure 2: Agricultural land lost to development by MSA (in acres)



Agricultural Land Lost to Development by County

Next, we consider agricultural land lost to development by county between 2001 and 2021. Table 3 presents the top 3 counties in each state with the highest number of acres of agricultural land converted to development while Figure 3 presents a visual picture of each county in the eight Midwestern states.

Will County (part of the Chicago-Naperville-Elgin MSA) had the largest amount of agricultural land converted to development at 31,566 acres. This was 20% of the total ag-to-development conversion for the state of Illinois. The next highest county was Polk County, part of Iowa's Des Moines-West Des Moines MSA, which lost 19,664 acres. Third highest loss was 18,068 acres in Hamilton County within Indiana's Indianapolis-Carmel-Anderson MSA.

Table 3: Agricultural land lost to development in Midwestern states (top three contributing counties)

State	MSA	County	Ag land in 2001 (acres)	Ag land in 2021 (acres)	Ag land lost to development (acres)
Illinois	Chicago-Naperville-Elgin, IL-IN-WI	Will	249,910	229,797	31,566
		Kane	149,618	135,974	15,263
		McHenry	190,342	189,887	10,264
Indiana	Indianapolis-Carmel-Anderson, IN	Hamilton	137,537	119,472	18,068
		Hendricks	152,827	141,764	12,154
	Fort Wayne, IN	Allen	225,702	215,612	8,254
Iowa	Des Moines-West Des Moines, IA	Polk	190,121	171,149	19,664
		Dallas	287,095	281,860	5,588
	Cedar Rapids, IA	Linn	262,231	263,008	5,404
Michigan	Grand Rapids-Wyoming, MI	Ottawa	140,948	135,654	4,133
	Ann Arbor, MI	Washtenaw	175,674	170,880	4,121
	Grand Rapids-Wyoming, MI	Kent	158,593	153,252	3,867
Minnesota	Minneapolis-St. Paul-Bloomington, MN-WI	Washington	109,376	98,427	9,603
		Dakota	195,942	185,535	9,280
		Hennepin	76,691	66,060	8,945
Missouri	St. Louis, MO-IL	St. Charles	143,291	131,982	8,591
	Kansas City, MO-KS	Jackson	127,748	119,382	8,345
		Clay	137,001	127,224	8,343
Ohio	Columbus, OH	Franklin	70,432	62,041	13,170
		Delaware	142,662	131,558	9,547
	Cincinnati, OH-KY-IN	Butler	116,939	109,034	6,975
Wisconsin	Madison, WI	Dane	431,039	411,234	16,167
	Milwaukee-Waukesha-West Allis, WI	Waukesha	100,228	88,525	11,683
	Green Bay, WI	Brown	181,881	172,193	8,695

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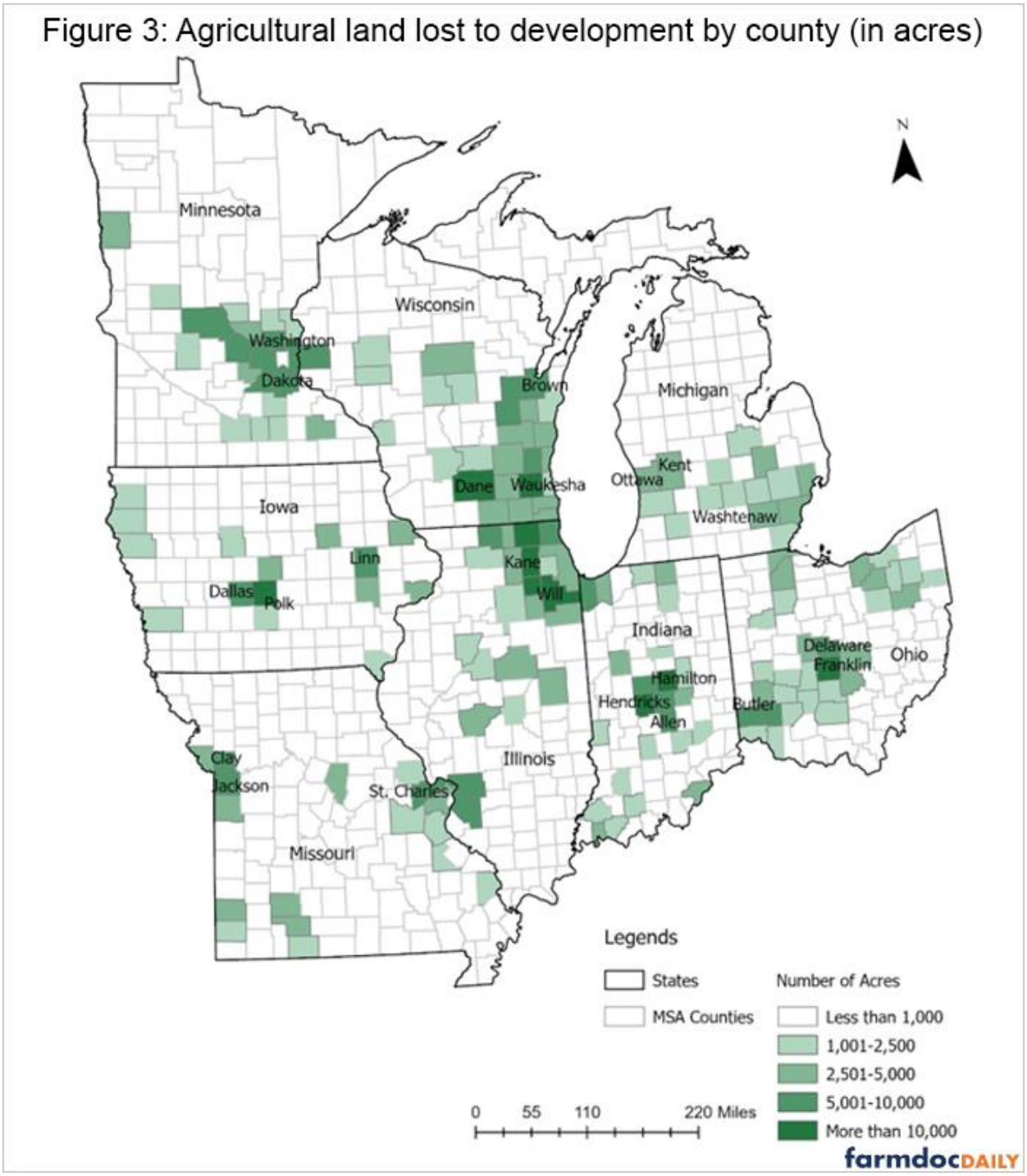
Figure 3: Agricultural land lost to development by county (in acres)



Summary

Between 2001 and 2021, agricultural land in the eight Midwestern states decreased by 1,595,655 acres (1.06% of total agricultural land in 2001). Conversion to developed land accounted for 877,386 acres (about 55%) of this loss, likely from urbanization and infrastructure expansion. Thus, while the role of urbanization is important, other factors are also at play and need to be examined to fully understand the loss of agricultural land.

Iowa had the highest proportion (90%) of its lost agricultural land converted into developed land, while Illinois had the greatest loss in acres (155,653). Large urban areas play a paramount role as 81% of agricultural land lost to development in the eight states occurred within Metropolitan Statistical Areas (MSAs). If a desire exists to reduce the loss of agricultural land to development, it must address the expansion of large urban areas.

Data Note 1

According to NLCD, agricultural land is defined as any area designated as cultivated cropland or pasture/hay. Cultivated cropland includes perennial woody crops such as orchards and vineyards. Pasture/Hay are areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. By definition, within each land observation, cultivated cropland or pasture/hay vegetation accounts for more than 20% of total vegetation.

Developed land is composed of these categories: (a) developed open space, (b) developed low intensity, (c) developed medium intensity, and (d) developed high intensity. Developed open spaces consist of some constructed materials but are mainly covered with vegetation, such as lawn grasses, with less than 20% of the area being impervious surfaces. These areas include large-lot single-family homes, parks, golf courses, and vegetation used for recreation, erosion control, or aesthetic purposes. Developed low-intensity areas contain a mix of built materials and vegetation, with 20% to 49% of the area being impervious surfaces, typically including single-family homes. Developed medium-intensity areas, where impervious surfaces cover 50% to 79% of the area, also primarily consist of single-family homes. Developed high-intensity areas have 80% to 100% impervious surfaces and are characterized by dense human habitation or commercial/industrial activities, such as apartment complexes, row houses, and commercial or industrial zones. For additional discussion, visit National Land Cover Database Class Legend and Description | Multi-Resolution Land Characteristics (MRLC) Consortium

References and Data Source

Multi-Resolution Land Characteristics Consortium. (2021). National Land Cover Database class legend and description. Retrieved from NLCD 2021 Land Cover (CONUS) | Multi-Resolution Land Characteristics (MRLC) Consortium