

**Accounting for Land in the United States:
Integrating Physical Land Cover, Land Use, and Monetary Valuation**

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Currently “Real Estate” is included in the USA balance sheet accounts – a composite asset of land + structures. The focus of this work is valuation of land – using an SNA/SEEA-CF approach but also including LC and LU data sets for dividing the data into 7 different strata, integrating physical data with production of land values.

Hedonic regression models were used to estimate land value for each of following 7 Land Use categories using “Big Data” encompassing millions of property transactions across the U.S. This analysis produced a price per acre (PPA) for each property in states for which there is transaction data. These PPAs were then used to make a weighted average valuation of the land in each census tract – which is then aggregated up to generate regional and national land valuation estimates for Census Regions (4) and Divisions (9) covering the continental U.S.

The Land Use data set allowed one of the following 7 categories to be assigned to each census tract included in the analysis:

- Dense Urban Residential
- Urban Residential
- Suburban Residential
- Rural Residential
- Commercial
- Industrial
- Agricultural

Note: Not all land was included – government-owned land was excluded from the valuation calculations, for example.

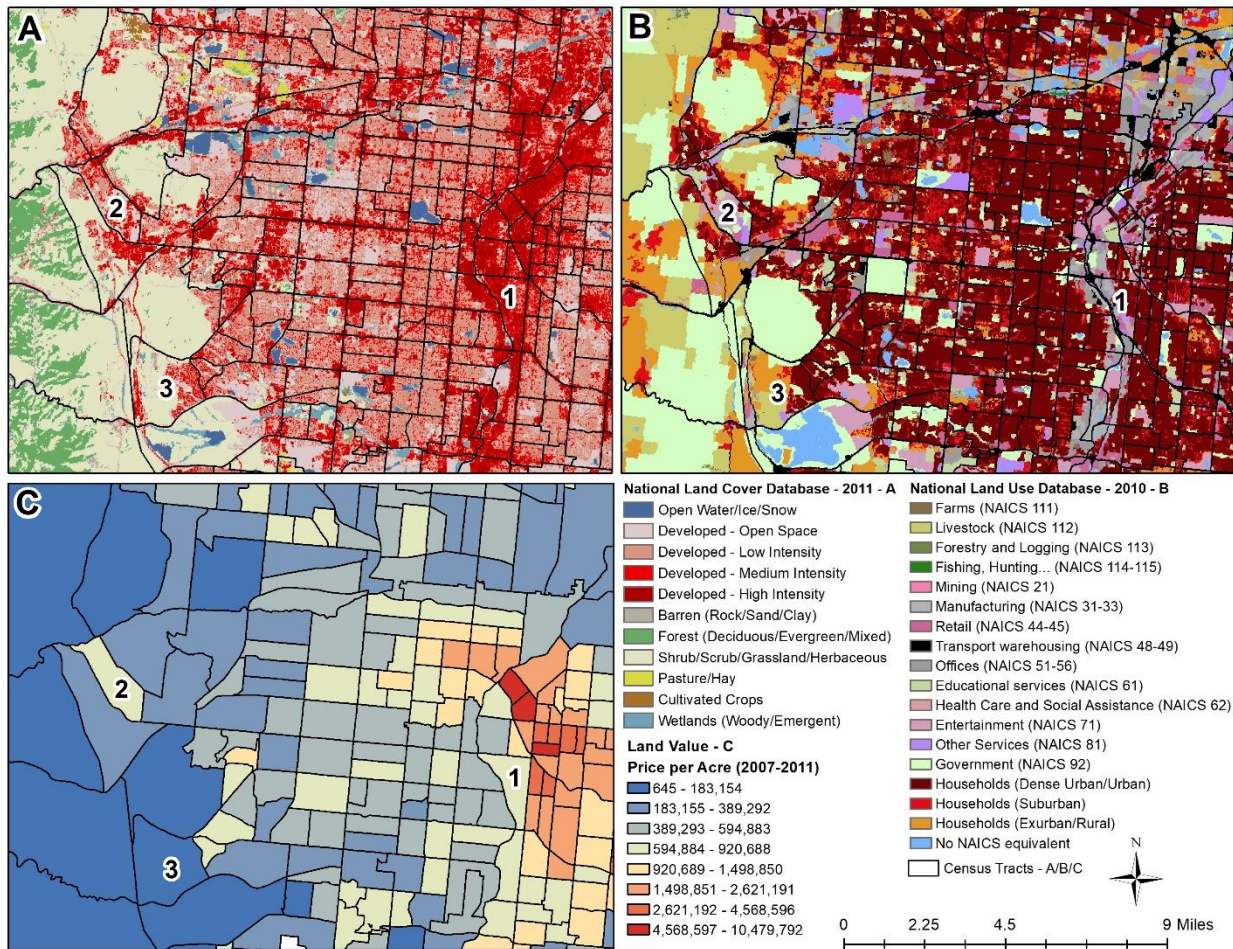
Tax assessment data are often used by countries for land valuations, but recently Zillow has released a large dataset to BEA for research purposes, combining and organizing public data from thousands of local municipalities. <https://www.zillow.com/> has *market transactions* – actual sales for millions of properties in the USA – which also includes a vast array of characteristics associated with the properties. This is really “Big Data”! Dedicated servers were needed to house the data and for performing calculations, producing the results below.

Traditional SEEA-CF Physical Land Cover Accounts and SEEA-CF Land Use Accounts were also developed (Opening stock, Additions to stock, Reductions in stock, Closing stock). We have linked this data directly with the Zillow data as part of our hedonic model – integrating physical LULC data with property-level real estate data for valuation.

Example of results: **Acreage, Total Value, and Average (Nominal) Price Per Acre by Census Division** (US totals and Pacific Division (States of Washington, Oregon and California as example)

	NLUD 2010 Total Acreage (000s) (1)	2002 - 2006		2007 - 2011		2012 – 2016	
		Total Value (\$Billions) (2)	Average Price Per Acre (\$) (3)	Total Value (\$Billions) (4)	Average Price Per Acre (\$) (5)	Total Value (\$Billions) (6)	Average Price Per Acre (\$) (7)
U.S. National Totals	1,264,975	\$33,681	\$26,626	\$24,173	\$19,109	\$33,888	\$26,789
Pacific							
Dense Urban Residential	237	1,101	4,649,537	702	2,965,103	939	3,966,882
Urban Residential	2,415	2,890	1,196,770	1,599	662,202	2,577	1,067,320
Suburban Residential	1,629	1,866	1,144,864	1,097	673,393	1,797	1,102,608
Rural Residential	9,893	250	25,264	146	14,759	243	24,599
Commercial	611	540	883,317	542	886,953	823	1,347,576
Industrial	261	104	396,744	105	403,117	163	624,566
Agricultural	78,480	453	5,768	433	5,517	651	8,292

Figure 3 – An Illustrative Example of Linking Land Cover, Land Use, and Valuation Data. Land cover-2011 (A), Land use-2010 (B), and Land value 2007-2011(C) for Denver and its western suburbs. Census tracts are present in each map pane and can be used to link specific land-use and land-cover types to an averaged land value estimate.



The labels 1, 2 and 3 in Figure 3 illustrate how data can be misinterpreted without the use of the LULC datasets combined with the valuation data from Zillow.

Label (1) is located in an area where the land cover is primarily high-density developed, which if residential would likely be assigned a high value. Land-use data show that this area is actually a mix of residential, retail, health care and social assistance, and offices, which drops the price per acre compared to the high-density residential seen in that dark red areas of map pane B.

Label (2) has a portion of the Census tract covered by shrub/scrub, but still shows most of the areas in high- and medium-density developed. This shifted the per-acre price upwards compared to the surrounding tracts that contain mostly open space and some rural communities based on the land-use data.

Label (3) shows another area that appears to be mostly low- and medium density developed, with some areas of high- density developed land on the eastern side. Due to the amount of low- and medium-density residential land use, this tract still shows lower price per acre (the presence of a large area classified for livestock also contributes to the lower value assigned by the Zillow dataset).

The ability to make these connections between spatial LULC and monetary valuation accounts is a key aspect of our land accounts that can help identify potential land-value misclassifications, helping produce a more integrated, richer understanding of land in the USA.