Statewide 2018 Land Use Map Methodology Documentation
2024 Edition

Maryland Department of Planning

Product Overview

The Maryland Department of Planning's (MDP) statewide land use map shows the general location of developed lands, including residential, commercial, industrial, institutional, and other urban lands as well as the general density of residential development statewide as of 2018. The map was developed using available parcel polygons attributed with tax assessment data as of project initiation in early 2020, Computer-Assisted Mass Appraisal (CAMA) data dated February 2020, and the Chesapeake Bay Program's 2017/18 Land Use Land Cover data (2022 edition), subsequently referred to as "CBP LULC." The map also incorporates land use datasets provided by county and municipal jurisdictions to the extent possible while maintaining standard statewide classification definitions and rules. The product was developed to be consistent with the 2018 National Agriculture Imagery Program (NAIP) imagery and CBP LULC dataset. MDP's draft updated land use classification scheme is available as a separate document.

This product is a beta release for public use and further testing. Methods for developing subsequent releases beyond this 2018 baseline will be refined based on feedback from the user community.

Potential Uses of the Statewide Land Use Map

Historically, the product has been used by local, state, and other stakeholders for various purposes. Key examples include:

- Mapping existing land uses in local comprehensive plans
- Estimating pollutant loads into the Chesapeake Bay by land use
- Targeting land preservation efforts
- Identifying the potential land use impacts of a proposed transportation or other major infrastructure project to fulfill National Environmental Policy Act (NEPA) requirements

Methodology Updates

MDP previously produced Land Use Land Cover (LULC) maps for 1973, 2002, and 2010. Based on stakeholder feedback, MDP incorporated several methodology changes since the 2010 LULC map, including:

Map developed (urban) land uses only. In addition to mapping developed land uses, previous maps distinguished between different types of undeveloped land such as agriculture, forest, wetland, and barren lands. Since the 2010 Land Use Land Cover map was produced, the Chesapeake Bay Program (CBP) began publishing high-resolution LULC datasets that include the above categories. To avoid redundancy, MDP mapped developed land uses only and classified remaining areas as "other land". MDP also consolidated the former Very Low Density Residential classifications [Large-Lot Subdivision (Agriculture) and Large-Lot Subdivision (Forest)] into a Very Low Density Residential category. MDP refers to the updated map as a land use map instead of a land use land cover map.

Automate and standardize. Since the 2010 Land Use Land Cover map, MDP obtained statewide parcel polygon coverage for the first time, which enabled MDP to further automate and standardize mapping procedures. MDP established standard rules for determining the spatial extent of development on large parcels and eliminating from the Very Low-Density Residential category isolated residences assumed to be rural.

Classify all roadways as transportation. Newly available parcel polygons and high-resolution LULC data from CBP enabled MDP to include the entire roadway network within the transportation category, which formerly included highways. Given the transition from a land use land cover map to a land use map, MDP also reclassified low vegetation within the right-of-way network as Transportation instead of Open Urban Land.

Comparison with CBP LULC Data

The difference between MDP's land use map and the CBP LULC data is that MDP distinguishes between different urban land use types, such as low versus high density residential, commercial, industrial, other types of developed lands. The CBP LULC data uses a different classification scheme that distinguishes between impervious surfaces, structures, tree canopy, wetlands, and cropland, among others. The MDP dataset has the potential to be a powerful tool for local planning either as a stand-alone product or when used together with the CBP LULC data.

Urban development is also measured differently in MDP's Statewide Land Use Map than the CBP LULC dataset. For example, the CBP LULC classifies impervious surfaces as developed statewide, while MDP's dataset excludes from development impervious surfaces and other improvements on rural parcels. Additionally, MDP's map generally classifies built urban parcels less than 5 acres as entirely urban/developed, while the CBP LULC dataset includes more detail about developed and undeveloped land uses within these parcels. Users should keep these differences in mind when selecting a land use dataset to use for a particular purpose. MDP's map should not be used for projects that rely on summarizing the full extent of forest, for example, since MDP's map reclassifies forest as urban on built parcels less than five acres.

Caveats and Issues for Future Consideration

MDP's land use map estimates and generalizes the distribution of developed land statewide for general planning purposes and should not be used to identify land uses on individual parcels. Given methodology changes, the baseline 2018 map is not comparable with MDP's previous Land Use Land Cover products and should not be used to assess change over time. Land not classified as urban does not equate to developable land.

Classifications for solar arrays vary throughout the map, as the beta release did not focus on incorporating solar arrays independently from other land uses. MDP identified extractive areas using the CBP LULC dataset and carried over historical extractive areas not qualifying for another land use from the 2010 Land Use Land Cover map. Classifications within mixed-use areas vary depending on local data, the 2010 Land Use Land Cover classification, and how these parcels are attributed for tax assessment purposes.

Methodology

MDP generated the draft land use map in two steps:

1. **Step One – Classify Parcels**

Overview:

MDP assigned a land use to all parcels in the state using a combination of tax assessment data, the CBP LULC, the 2010 Land Use Land Cover map, and available land use data from local jurisdictions. Parcels received an urban (developed) classification if they contained residential, commercial, or other improvements associated with developed uses based on tax assessment information and other criteria. Classification algorithms considered multiple data sources to help ensure consistency with the statewide classification scheme and 2018 conditions. MDP assigned only one developed use to a parcel but split a few parcels containing multiple developed uses at least five acres each.

Methodology Detail:

MDP identified developed parcels containing urban improvements based on tax assessment data. To help ensure consistency with the 2018 NAIP imagery, MDP models required these improvements to include a building constructed before 2019 or a commercial and industrial use description and at least 55 square meters of CBP LULC impervious surface or structures. MDP used the CBP LULC dataset, data from local jurisdictions, MDP's 2010 LULC map, and other ancillary data to identify additional developed uses that could not be captured from tax assessment data alone. Figure 1 - Urban Use Decision Tree, located at the end of this document, contains a flow chart illustrating these procedures.

After identifying developed parcels, MDP first assigned developed classifications to parcels containing manually verified facilities. These included select commercial facilities (airports and other key commercial facilities such as amusement parks); industrial power plants; key institutional facilities (hospitals, landfills, other public facilities, schools, and nursing homes); select open urban lands (cemeteries; fairgrounds, golf courses, and parks/campgrounds); high-density residential trailers parks without lot lines to separate units; and transportation facilities (transit stations or park and ride lots).

MDP then used models to automate classifications for the remaining developed parcels. Model algorithms considered tax assessment data (e.g., land use descriptions, commercial and industrial use descriptions, tax exempt descriptions, and building descriptions), MDP's 2010 Land Use Land Cover dataset, and available local land use data where local classifications could be matched with MDP's classification scheme. MDP derived parcel acreages from legal acres or the GIS parcel polygon acres where the legal acreage was zero or differed from the parcel polygon acreage by more than 25%.

MDP incorporated the following generalizations into the automated classification process:

- Within dense areas (clusters of five parcels < 0.25 acres), classifications reflected 2010 or local classifications regardless of tax assessment attributes where another parcel of the same classification was found within the vicinity.
- MDP generalized out (i.e. reclassified as residential) commercial, industrial, and institutional uses less than one acre within residential subdivisions unless the non-residential use is reflected in the 2010, local, or manually verified land uses, or the same non-residential use was present within the parcel's vicinity.
- MDP generalized industrial properties as follows unless the 2010 Land Use Land Cover map or local data suggested otherwise:
    - Aggregated industrial regions less than one acre were reclassified as commercial
    - Commercial parcels less than 20 acres and adjacent to industrial parcels with the same owner were considered industrial if the industrial portion comprised at least one acre or 25% of the commercial/industrial region.
- Since residential unit counts per parcel were not available statewide, MDP required potential multifamily properties with an apartment indicator to meet certain criteria to help ensure only those areas with more than 8 dwellings per acre were classified as high-density residential. Potential multi-family properties were aggregated into regions. Regions that did not meet any of the following three criteria were reclassified as single-family residential areas:
    1. The region contains any of the following:
        - High-density or multi-family residential parcels from the 2010 land use map or local data
        - A trailer park
        - High-density residential uses associated with a common element
        - Parcel with at least eight units per acre based on tax assessment attributes or ancillary data
        - Parcel with a multi-family residential commercial and industrial use code
    2. Sum of the CAMA Building square footage within the region is greater than 8,000
    3. Assessment data indicate any building within the region contains more than three stories

The parcel classification scheme mirrors that of the final land use map product, except residential parcels are not yet assigned a density. Instead, MDP classified residential parcels as either single-family (100) or multi-family (130). Parcels that did not fit a classification, such as utility lines, rail rights-of-way, and boat slips, were assigned an "other" classification (999).

2. **Step 2 – Model residential density and developed extent.**

Overview: For statewide consistency, MDP used model rules to:

- Generalize residential density within single-family residential areas. MDP generalized residences on lots less than 20 acres but at least five acres as Other Land instead of residential land if not clustered with at least five other residences or if a poultry house was present. MDP classified all multi-family residential parcels as High-Density Residential.
- Distinguish between developed and undeveloped portions of parcels containing urban uses and classify the undeveloped portions as Other Land. MDP classified developed parcels less than five acres that contain a CAMA building as fully urban/developed.
- Fold developed portions of "other" parcels (e.g. utility easements, rail lines, boat slips) into their surrounding uses.
- Superimpose onto the map historical (2010) and CBP LULC extractive areas, water, impervious roads, and unwooded portions of road rights-of-way.

Methodology Detail:

To generalize residential density, MDP mostly carried over generalized densities from the 2010 Land Use Land Cover map except within or near newly built areas. In these areas, MDP generalized density across clusters of single-family residential parcels with similar lot sizes. However, MDP individually classified multi-family parcels as "High-Density Residential" and single-family residential parcels with lot sizes of at least five acres as Very Low Density Residential. Very Low Density Residential parcels containing poultry houses or located outside clusters of at least five residences were then assumed to be rural and reclassified as Other Land.

Before distinguishing between developed and undeveloped portions of developed parcels, MDP superimposed onto the map historical and active extractive areas that did not follow parcel boundaries or meet the criteria for another use along with impervious roads, non-wooded portions of rights-of-way, and water. To determine the developed extent of each parcel, MDP considered parcels less than five acres with a residential or commercial structure to be fully urban/developed. MDP excluded undeveloped portions of other parcels from development by rasterizing the classified parcels and combining them with the CBP LULC at a five-meter resolution. Figure 2 - MDP Land Use/CBP Land Use Land Cover Crosswalk (located at the end of this document), clarifies which CBP LULC classifications are considered developed in MDP's map. The minimum mapping unit is 0.10 acres for undeveloped portions of developed parcels. As a final step, MDP folded developed portions of parcels classified as "Other" (999) into their surroundings.

Review Process

Local jurisdictions received an opportunity to review the product before publication. Based on feedback, MDP reclassified the primary land use on individual parcels where proposed corrections were consistent with the statewide classification scheme, existing land use conditions as of 2018, Urban Use Decision Tree (Figure 1), rules for determining the extent of development on each parcel (Figure 2), and rules for generalizing residential density. MDP will consider comments regarding development after 2018 for future releases that intend to map conditions beyond the 2018 baseline.

To maintain statewide consistency, MDP did not complete manual corrections related to the following statewide rules, but may reconsider rules following the beta release:

- MDP did not adjust rules for distinguishing between urban and other land within each parcel. For example, within large parcels or parcels without structures, only built-up portions of the parcel (e.g. impervious surface or turf grass in the CBP LULC dataset) were classified as urban. This rule affects many parks and open spaces.
- MDP generally did not reclassify parcels containing residential or commercial uses as non-urban land unless the improvements primarily supported agricultural uses (e.g., parcel contained both a telecommunication tower and poultry house).
- MDP generally did not reclassify agricultural parcels as urban if they did not meet improvement criteria in Figure 1 - Urban Use Decision Tree.
- MDP did not reclassify the following as residential: 1) residential lots 20 acres or more in size and 2) residential lots between five and 20 acres that did not meet statewide clustering requirements for Very Low Density Residential uses.

MDP used lot sizes, not housing unit types, to generalize single-family residential density. Lot sizes for some single-family attached developments qualified as medium-density residential under the current classification scheme.

- MDP could not re-evaluate rules for incorporating solar, mixed-use, road and utility right-of-way, and extractive areas for the beta release, but may consider adjustments for future releases. MDP did not split parcels into multiple developed uses unless the footprint of each use was at least five acres.

Figure 1 - Urban Use Decision Tree
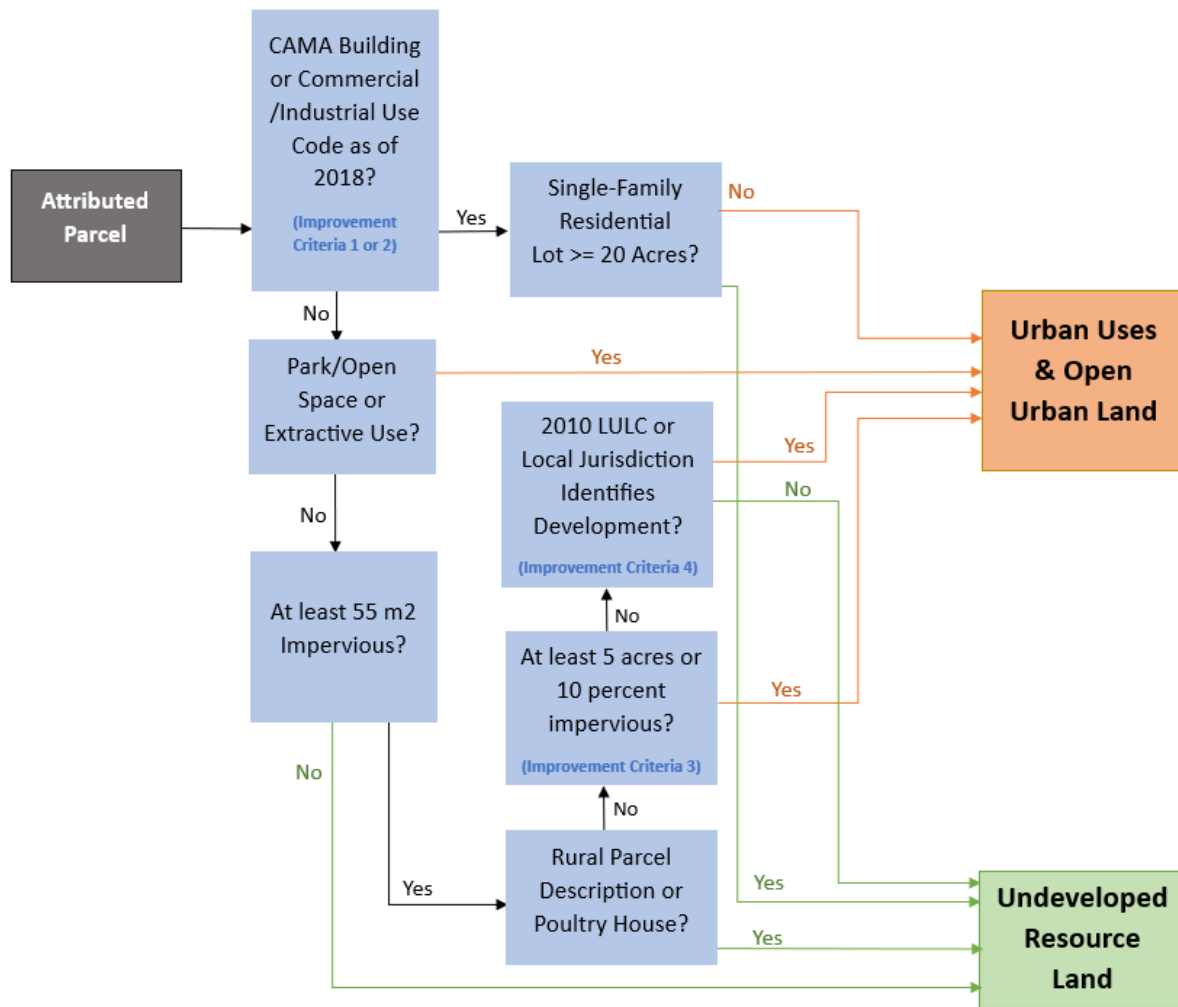
Note: To help ensure consistency with the 2018 NAIP imagery, MDP models required parcels containing a Computer-Assisted Mass Appraisal (CAMA) building to include a building constructed before 2019 or a CBP structure. Similarly, a parcel with a commercial and industrial use description must contain at least 55 square meters of CBP LULC impervious surface/structures. A Rural Parcel Description refers to parcels assessed as Agricultural or Marsh Land.

Figure 2 - MDP Land Use/CBP Land Use Land Cover Crosswalk

Chesapeake Bay Program General Land Use	MDP Land Use				
	11-18, 190, 80 (Excluding Road/ROW)		80 (Road/ROW)	50	99
	Developed (Urban) Uses on Parcels < 5 Acres with a CAMA Building (excluding ancillary structures such as boat slips, parking areas, and residential storage units)	Remaining Developed Uses*	Roads & Rights-of-Way	Water	Other Land
Impervious Roads (including Tree Canopy over Roads Detailed Classification)	No	No	Yes	No	No
Impervious Structures and Impervious, Other	Yes	Yes	Yes	No	Yes
Tree Canopy over Impervious	Yes	Yes	Yes	No	Yes
Turf Grass	Yes	Yes	Yes	No	Yes
Tree Canopy over Turf Grass	Yes	Conditional**	No	No	Yes
Pervious Developed, Other	Yes	Conditional***	Yes	No	Yes
Extractive	Yes	Yes	Yes	No	Yes
Forest, Harvested Forest, and Tree Canopy, Other	Yes	No	No	No	Yes
Natural Succession	Yes	No	No	No	Yes
Cropland and Pasture/Hay	Yes	Conditional****	Yes	No	Yes
Non-forested wetlands (Tidal, Riverine, or Terrene)	Yes	No	No	No	Yes
Water	No	No	No	Yes	No

Notes:
*Also includes parcels with the interim classification 999 (Other)
**Included on improved parcels only
Included within industrial properties, manually verified landfills, historical extractive areas, and entrapped undeveloped regions < 100 acres. Also see *

****Cropland, Pasture/Hay, and Suspended Succession Herbaceous (of Pervious Developed, Other) included only within manually verified airports, cemeteries, landfills, historical extractive areas, and golf courses.

The minimum mapping unit is 0.10 acres for undeveloped portions of developed parcels. MDP also folded developed portions of parcels classified as "Other" (999) into their surroundings.

Please see the 2017/18 LULC (2022 Edition) Data Project "READ ME" Documentation, linked from the dataset webpage, for the Chesapeake Bay Program's general land use definitions. Please see the Maryland Department of Planning Draft Statewide Land Use Classification Definitions, available as a separate document, for MDP land use definitions.