Changes in the Number of Census Blocks, 2000-2010

The methodologies for delineating census blocks for both the 2000 and 2010 decennial censuses are consistent in terms of the types of features used to form census block boundaries. In addition, as with previous censuses, boundaries of all higher level tabulation geographic entities form census block boundaries. The general goals of census block delineation remain the same:

1. A census block generally is bounded by roads, as well as other visible features.
2. Non-visible boundaries of higher-level geographic entities always form census block boundaries.
3. Wherever possible, features suggested by state redistricting officials as "must-hold" boundaries are held as census block boundaries.
4. In suburban and rural areas without a highly developed road network, the census block delineation methodology may use landscape features that otherwise might not have formed block boundaries.

From these basic goals, in areas with stable road networks and relatively stable geographic entity boundaries, including highly developed areas, census blocks will continue to look the same from Census 2000 to the 2010 Census. Substantial increases in the number of features as well as substantial modifications to existing linear features and their attributes as well as to the feature network (i.e., connectivity), may affect the number and configuration of census blocks between 2000 and 2010.

The number of census blocks defined for the 2010 Census in the fifty states, the District of Columbia, and Puerto Rico is **11,155,486**. For Census 2000, 8,262,363 census blocks were defined for the same area. This represents an increase of 2,893,123 census blocks, or 35 percent, between Census 2000 and the 2010 Census. There were 7,020,924 census blocks defined for the 1990 Census (the first in which census blocks were defined nationwide). Although the overall trend is an increase in the number of census blocks, the number of blocks decreased in 134 counties. Factors affecting census block delineation and resulting in either increase or decrease in the total number of census blocks for a particular county are discussed below.

The following factors may contribute to an <u>increase</u> in the number of census blocks within any particular county:

Unlike the 2010 Census, there was no comprehensive feature update operation in preparation for Census 2000. The number of new features in the MAF/TIGER database (MTDB) for the 2010 Census reflected nearly 20 years of development, although some of the new features had been collected as part of census operations during Census 2000. In addition, improvements in positional accuracy for existing features resulted in many changes to the feature network of the MTDB. Given these facts and others noted below, it was expected that the number of census blocks would increase for most counties between the 2000 and 2010 delineations because of the increased number of features in the MTDB. The impact of MAF/TIGER Accuracy Improvement

Project (MTAIP) between 2003 and 2008 resulted in improvement to spatial locations, large increases in the number of new features, and changes in attribution on existing features.

Increase in features

An increase in the number of features (mainly roads and hydrography), primarily as a result of features added during MTAIP, but also through other geographic update programs and field operations, such as Address Canvassing, the Local Update of Census Addresses (LUCA), and the Boundary and Annexation Survey (BAS), has contributed to an increase in the number of census blocks.

The large increase in road features is the most obvious and basic reason for an increase in census blocks. Because roads serve as the primary basis of census block delineation, any increase in the number of roads within a county leads to a corresponding increase in the number of blocks.

The large increase in hydrographic features as a result of the inclusion of the National Hydrography Dataset from the United State Geological Survey (USGS) is also a major cause for census block increase. The quantity of areal hydrographic features (as defined by shorelines with water "filling" the space between shorelines) has increased, and the combination of areal hydrography and geographic entities can cause many more water-only blocks than existed in 2000. Areal hydrography includes lakes, ponds, as well as "double-line" hydrography; that is, rivers for which both shorelines are portrayed in the MTDB with water area in between. Most lakes and ponds split by geographic entities will have their shorelines held as census block boundaries. The increase in water-only blocks is noticeable, particularly in Alaska and coastal counties.

There also was a large increase in single-line hydrographic features; that is, rivers and streams that are represented in the MTDB by a single line. Although a large number of these were classified as "intermittent," in some counties the amount of perennial single-line hydrography increased considerably. In larger counties, this increase in hydrography caused a comparable increase in the number of census blocks.

Addition of non-visible lines to define geographic areas

Non-visible lines were selectively added to MTDB to better define the boundaries of voting districts (VTDs), census designated places (CDPs), and ZIP Code tabulation areas (ZCTAs) for the 2010 Census. For Census 2000, VTD boundaries were required to conform to visible features and existing administrative and governmental unit boundaries; CDP boundaries generally were required to conform to visible features. To provide a better representation of ZIP Codes when defining ZCTAs based on 2010 census blocks, the Census Bureau added approximately 30,000 non-visible lines to the MTDB for use as census block boundaries. This number is marginal compared to the 70 million segments in the MTDB. The result will be fewer ZCTAs containing multiple ZIP Codes, and a closer relationship between ZIP Codes and ZCTAs.

Increase in geographic entities

Depending on the county, an increase in the number of census blocks may result from an increase in the number of geographic entities within that county. Nearly every 2010 census geographic entity type has increased in number, resulting in an increase in the number of census blocks as all higher level census geographic area boundaries are held as block boundaries.

More restrictive census block numbering for islands

For Census 2000, all islands within a single block group and county could have been assigned a single census block number as long as each island was within one mile of another island with the same number. Thus, a single large census block encompassing multiple islands and extending for many miles could have been defined as long as each island was within one mile of another island. For the 2010 Census, all islands with the same census block number had to be within five kilometers of each other. Also, as with other feature improvements in MTDB, there has been an increase in the number of islands. These factors have increased the number of island blocks in more sparsely populated coastal areas including Alaska and Louisiana.

Elimination of water-only block merging

For Census 2000, water-only areas were merged together into large and often long, string-like census blocks. These census blocks tended to be unwieldy when delineating geographic areas that use census blocks as "building blocks," such as legislative districts, urban areas, and ZCTAs. For the 2010 Census, water-only areas are held separately, and are not merged. This decision was made to prevent the large water-only blocks from causing problems in a variety of other products and programs.

No more suppression of roads within Military and National Park areas

For Census 2000, roads within military installations and National Parks were not consistently held for census block delineation. This requirement has been removed, and military installations and National Parks were treated the same as the rest of the nation.

"Participant Must Hold" features

Participants in the Redistricting Data Program's (RDP's) Block Boundary Suggestion Program (BBSP) were able to provide input as to which features must be held and which features should not be held as census block boundaries. Although "Participant Must Hold" features will generally not be a large contributor to the overall increase in census blocks, they help explain individual cases where a specific block would not have been created based on established census block delineation criteria.

Additional features used for census block delineation

Although the general approach to census block delineation for the 2010 Census is consistent with the approach used for Census 2000, the 2010 delineation was more inclusive. The inconsistency of attribution and connectivity (i.e., gaps) among linear features, especially roads and hydrographic features, led us to decide that the census block delineation algorithm should use additional types of features to avoid merging across major, important features that data users require and expect to be held as block boundaries (e.g., a major road that is partially coded as a local road and partially coded as an alley or exit ramp). When identified, these inconsistencies and errors are included as MTDB data maintenance corrections.

The following factors may contribute to a <u>decrease</u> in the number of census blocks within a particular county:

Decrease in the number of block groups within the county

In the counties that have seen the most dramatic decrease in the number of census blocks for the 2010 Census, one cause is often a decrease in the total number of block groups within a county. Because block groups must meet a minimum population threshold of 600 persons, any Census 2000 block groups that fell below the minimum population threshold were merged with an adjacent block group.

For the 2010 Census, as well as for Census 2000, each block group may not contain more than 1,000 census blocks (*x*000-*x*999, where **x** is the block group number). Due to this limitation, counties that had a decrease in the number of block groups may see a corresponding decrease in the number of census blocks. For example, a county that formerly had 3,000 census blocks would be limited to only 2,000 blocks if the number of block groups in the county dropped from three to two between Census 2000 and the 2010 Census.

If a block group initially has more than 1,000 potential census blocks, the delineation algorithm begins merging across lower priority features until there are only 1,000 blocks. Features that initially qualified as census block boundaries would be merged across forming larger blocks in the process. This will lead to differences between the types of features held as census block boundaries as well as the size of blocks both within the county (where the number of census blocks has decreased), and between that county and nearby counties.

Hydrography now classified as intermittent

In many counties, single-line features that were held as 2000 census block boundaries are now classified as intermittent water features rather than perennial water features. The 2010 Census delineation only considered perennial water features as usable census block boundaries. In some cases, the attribution of the water features is very inconsistent, switching from perennial to intermittent frequently along the same water course. However, the widespread addition of intermittent water features during the decade necessitated this requirement that only perennial water features be used.

"Participant Do Not Hold" features

In some counties, the decrease in the number of census blocks is attributable in part to use of "Participant Do Not Hold" flags on features by BBSP participants. As a result, features that had been used as census block boundaries in Census 2000 were not used to form 2010 census block boundaries based on BBSP participants' instructions.

Loss of features or feature connectivity

Updates and corrections throughout the last decade altered the feature network to the extent that some counties saw a significant decrease in road features that were non-existent between Census 2000 and the 2010 Census. In sparsely populated counties, this can substantially reduce the number of census blocks. In addition, connectivity between features that existed in 2000 may no longer exist in the MTDB, with the result that gaps may exist between features that were portrayed as connecting previously. The census block delineation process attempted to compensate for this, but some areas may see changes. In some cases the connectivity is directly related to the change in the feature extensions used in 2000 compared 2010. In some instances, gaps between features (for instance, between the end of a road and the shoreline of a lake which creates a legitimate gap) were not closed off in 2010, resulting in one census block where there might have been two for Census 2000.

Loss of connectivity can affect a handful of census blocks within a county where one feature has lost connectivity with all the features that are nearby.