

# Methodology for July 1, 2019 Population Estimates

## Arizona Office of Economic Opportunity (OEO)

---

### COUNTY ESTIMATES

The county-level estimates (county controls) are developed using a Composite Method which relies on several sources of administrative data for four age groups: births and deaths for ages 0-4, school enrollment for ages 5-17, driver's licenses and ID cards for ages 18-64, and Medicare and Social Security enrollments for ages 65+. In general, we create a ratio of the census household population in each age group to the population indicated by administrative records for the census date. This ratio, called Censal Ratio, is applied to the administrative data for the reference date of July 1 of the estimate year. The independent population estimates for each age group are added together to obtain the Household population for each county. The Group Quarters (GQ) population is then added to produce the Total population control for each county.

GQ population is estimated in the following steps:

1. Establish the total GQ population in each place (incorporated place or unincorporated balance of county) as of Census 2010 (taking Count Question Resolution into consideration);
2. Track the GQ population of major facilities annually starting April 2010 and for each subsequent July;
3. Find the change in GQ population in these facilities between April 2010 and the estimate year. If data is missing for either April 2010 or for the estimate year, then that record is not used in calculating the change;
4. Estimate total GQ population of each place by adding numbers from Step 1 and Step 3.

### SUB-COUNTY ESTIMATES

Estimates for incorporated places and unincorporated balances of county are produced using the controlled housing unit method (HUM). The following steps are executed:

1. Use the Count Question Resolution results to update Census 2010 housing units, household population, persons per housing unit, and Group Quarters population, for each jurisdiction.
2. Determine the July 1, 2019 housing unit stock by adding cumulative completions or building permits between Q2 2010 and Q2 2019 to the Census 2010 housing stock. For permits, a six-month lag is assumed for single-family units and 2-4 units; a 12-month lag is assumed for 5-plus-unit buildings. It is assumed that 98% of permits are built. Mobile

homes are assumed to be in place the same quarter they are permitted with a 100% placement rate.

3. Pre-annexation household population is calculated by multiplying the new housing unit stock by (CQR-adjusted) census persons per housing unit.
4. For annexations that contain housing units, the actual number of occupants is determined from field information. If that is not possible, census block-level occupancy rate and persons per household are used. When block-level data is unavailable, the annexing jurisdiction's census occupancy rate and persons per household information is used. The corresponding number of persons is then subtracted from the jurisdiction that de-annexed the housing units.
5. Adding up the numbers from steps 3 and 4 results in the unconstrained household population for each jurisdiction; this is summed up at the county level.
6. The county's HUM household population is then divided into the household population control obtained from the composite method to yield a "control factor" for each county.
7. The control factor is multiplied by the unconstrained household population estimate of each jurisdiction to get the "controlled" household population estimate.
8. Sub-county estimates are then finalized by adding the GQ population in at the jurisdiction level.

## **ADJUSTMENTS AND SPECIAL METHODS**

### **0-4 Age Group Censal Ratio Adjustment**

The original censal ratio was calculated using the births and deaths between 4/1/2005 and 3/31/2010 and the enumerated population on 4/1/2010. The resulting censal ratio reflected net migration that occurred during the period of 4/1/2005 to 3/31/2010. Because this five-year period was likely dominated by outmigration in the later part, the censal ratio for the state amounted to 0.934, or a 6.6% outmigration rate. Most counties experienced outmigration (except for Graham, Greenlee, and Pinal). This magnitude of outmigration, and perhaps the direction of net migration, is likely not accurate for most years since the 2010 census. For 2013 to 2017 estimates, we transitioned into a censal ratio of 1 for most counties (see the methodology documents for those years for details). For 2018 estimates, we believed that another update to the censal ratios is needed. In summary, the logic for the update is as follows:

1. Obtain tables B7001 and B7401 from the 2017 ACS 1yr data and 2012-2016 ACS 5yr data. Calculate an estimate of net migration over 1 year by subtracting results of B7401 from B7001 for the 1-4 age group. Since the ACS does not measure foreign outmigration, this value needs to be estimated with the use of vintage 2017 PEP net foreign migration.
2. The estimate for net migration is converted to a migration rate. Since children in the 0-4 age group experience an average of 2.5 years of migration, the rate is multiplied by 2.5. This results in a growth of 3.7%, which translates into a censal ratio of 1.037 at the state level.

3. If the estimate for net migration from the 5yr data is positive for a particular county, we choose to adjust its censal ratio to a value greater than 1. The value of the ratio is determined by finding the number that allows the sum of the county estimates to equal the independent state estimate obtained through using the 1.037 ratio. This is a simple equation where we solve for one variable. The solution, 1.0481, becomes the censal ratio for the counties we identified as needing adjustment. The remaining counties use one (1.00) for the censal ratio.

These census ratios are kept for the 2019 population estimates.

## Greenlee County Special Methods

Due to the reopening and expansion of the Freeport-McMoRan Gold and Copper (FMI) mine, there is overwhelming evidence that Greenlee County has experienced rapid population growth since the 2010 census. However, the composite method does not adequately capture this rapid growth. We decide not to use the composite method for Greenlee, but instead rely on other methods – the housing, resident, and employment information from FMI in the case of Clifton and Morenci (part of Balance of Greenlee County), and HUM plus electric accounts in the case of Duncan.

The basic principle of the method using FMI information is to find the change in the number of residents since Census 2010 and add that change to the Census 2010 population. FMI keeps a good record of their housing inventory and residents. The earliest list that was provided to OEO is for 8/30/2010. The current one is as of 12/2/2019. FMI confirmed that all the housing units on the 12/2/2019 list were already in place as of 7/1/2019. We also know that FMI was adding to its workforce between April and August of 2010. This will be addressed in Step 5c.

1. Find Census 2010 housing and population information for Clifton and Balance of Greenlee County.
2. Enter FMI housing and residents information as of 8/30/2010.
3. Enter FMI housing and residents information as of 12/2/2019.
4. Find changes of housing units and number of residents at FMI between 8/30/2010 and 12/2/2019 (Step 3 minus Step 2).
5. Find additional changes in population between 2010 and 2019 as determined from other sources:
  - a. Known permanent residents in RV parks in Clifton (current minus census time).
  - b. People on FMI housing waiting list. These are FMI employees waiting to get into company housing in Greenlee County. In years prior to 2018 it was presumed that these employees and their family already lived in the area (in RVs and other private housing). However, based on new information that we obtained in 2018, the majority of them are more likely to be living outside of the county (commuting from Safford or New Mexico. A small proportion may be in Greenlee). We attempted to estimate that proportion and distribute the population to Clifton and balance of county, but we determined that there is not

enough information for that. In the end, we decided to use the RV population in Clifton as an indication of how many of these people are living in Clifton. And we used the census 2010 population ratio between Clifton and balance of county to estimate a "waitlist" population for the balance of county. Our contacts from Greenlee County and FMI reported multiple RV parks along Hwy 75, in Apache Grove, and in Loma Linda. Accounting for them would lead to similar conclusions.

- c. Estimated change in the number of residents between April and August of 2010. This is the product of two factors: 1) the change in the number of FMI employees; 2) the ratio of FMI residents to employees. Both factors are based on confidential company data, and therefore the exact source data and calculations are kept confidential.
6. Adding Steps 4) and 5) to Census 2010 household population in Step 1) results in household population as of July 1, 2019.
7. Because of the change in how we account for the FMI employees and their family member on the company housing waiting list, there appear to be population declines in the Town of Clifton and in the balance of Greenlee County. It must be pointed out that this is due to a method change, not true population decline.

For Duncan, the following steps are followed:

1. Using data from Duncan Valley Electric Cooperative, determine the number of active residential electric accounts with at least 100 kWh average monthly use.
2. From the street drive conducted by personnel from Town of Duncan, Greenlee County, SEAGO, and ADOA in December 2013, estimate the number of RVs, mobile homes, and trailers that do not have their own electric meters (hooked up to housing units or as part of a master-metered RV/trailer park). The situation may have changed but we do not have more current information.
3. Add the numbers from Steps 1 and 2 together to estimate the total number of occupied units.
4. Obtain the 2010 Census persons per household for Duncan.
5. Apply the persons per household from Step 4 to the number in Step 3 to obtain the 2019 population estimate of the Town of Duncan.

## **Maricopa County and Pinal County**

OEO adopted the population estimates produced by the following councils of governments:

Maricopa Association of Governments (MAG) made sub-county population estimates for jurisdictions within Maricopa County. Central Arizona Governments (CAG) and MAG made sub-county population estimates for jurisdictions within Pinal County. They incorporated the 2015 special census results in their estimates. The methodology can be referenced at:

<https://population.az.gov/sites/default/files/documents/files/pop-estimates2019-mag&cag-method.pdf>.