

Water Resource Development Commission (WRDC)

Population Committee – Handout 10/15/10

Available Studies and Datasets:

1. ADES projections to 2055 (dated 2006)
<http://www.azcommerce.com/EconInfo/Demographics/Population+Projections.htm>
2. Councils of governments projections (to 2025 or later, circa 2006)
3. US Census national projection to 2100
4. UN world projection by continent to 2300
5. ADWR preliminary Basin Study (to 2060)
6. ADWR Water Atlas
7. ADWR AMA Assessments (to 2025)
8. http://www.azcommerce.com/doclib/econinfo/FILES/census_decennial.pdf

Contacts and Experts:

1. Arizona Department of Commerce (Bill Schooling and Jim Chang)
2. ADOT multi-planning
 - a. Tracy Clark
 - b. Mark Hodges
 - c. Keith Kellogg
3. Marshall Vest (U of A)
4. Rick Berman
5. Urban lands website - <http://arizona.uli.org/>

Possible State Projection Methods to 2110:

1. **Trendline**: Use the best fit trendline equation for the ADES projections through 2055 to project statewide population to 2110 ($= -0.007 * \text{LN}(x) + .0348621 = 17,179,863 \text{ people in 2110}$)
2. **Add Constant Number from 2055**: Assume a constant number of people added to Arizona from 2055 through 2110 using the number of people added to the state in 2055 from ADES = **17,238,582 people in 2110**
3. **Use Constant Growth Rate after 2055**: Hold the 2055 rate of state growth constant through 2055 (0.75%) = **17,267,760 people in 2110**
4. **Population Loss is Not Recovered, Proportion of State To US Stays Constant after 2055**: A linear growth rate is calculated using estimate for 2009 and projection for 2100. That linear rate is applied to all years between 2009 and 2110. Because the 2006 projection is four years old and the past four years has been quite different than previous years, the projection for the current year and the next few years are already not in alignment with reality. Dept. of Commerce is now projecting growth of 0.5% for 2010; 0.7% for 2011; and 1.5% for 2012. As a result, the projection for 2012 is 595,707 less than what was in the 2006 projection. In this scenario, we assume that the 595,707 people shaved from the front years will be lost forever in the projections series. Arizona's projected population as a proportion of projected national population generally rises up to 2055, but the rate of rise goes down gradually. After 2055, assume AZ's proportion will stay constant. Results in a population of **17,361,292 in 2110**.

5. **Population Loss is Recovered, Growth in Proportion of State to US Continues to Decline after 2055, Proportion is Constant after 2068:** A linear growth rate is calculated using estimate for 2009 and projection for 2100. That linear rate is applied to all years between 2009 and 2110. Because the 2006 projection is four years old and the past four years has been quite different than previous years, the projection for the current year and the next few years are already not in alignment with reality. We are now projecting growth of 0.5% for 2010; 0.7% for 2011; and 1.5% for 2012. As a result, the projection for 2012 is 595,707 less than what was in the 2006 projection. In this scenario, we assume that the long term projection for 2055 still holds. A smoothing method was used to add the 595,707 people shaved from the front years back to series. There are 43 years between 2013 and 2055 (inclusive). First, 595,707 is deducted from the original projection, then 1/43 of that is added back to 2013, 2/43 is added back to 2014... 42/43 is added back to 2054, and finally, the entire value of 595,707 is added back to 2055. Arizona's projected population as a proportion of projected national population generally rises up to 2055, but the rate of rise goes down gradually. In 2055, the rate of rise is going down by approximately 0.000004. We assume that Arizona's projected population as a proportion of the Nation's projected population will continue to rise after 2055 and that the rate of rise will continue to drop at the 2055 rate, until it reaches 0, at which point, AZ's proportion will stay constant. Results in a population of **18,386,501 in 2110**.

See the table below for comparison:

Method	2010	2035	2060	2085	2110
1	6,999,810	11,049,577	13,828,285	15,848,770	17,179,863
2	6,999,810	11,049,577	13,832,008	15,880,310	17,238,582
3	6,999,810	11,049,577	13,835,683	15,899,301	17,267,730
4	6,628,757	10,453,870	13,164,607	15,262,950	17,361,292
5	6,628,757	10,772,504	13,880,964	16,164,248	18,386,501

Challenges associated with long-term projections:

1. Regarding Population Projections that will be used by the Water Resources Development Commission Comments prepared by Arizona Department of Commerce Demographer [From Bill Schooling, State Demographer and Jim Chang, Senior Demographer, dated October 5, 2010]:

- Historical population growth is not an adequate indicator of long term growth rates; in several decades of the 20th century, Arizona grew at a remarkable rate, but these growth rates will not be matched for much of the 21st century. If Arizona's population was 6.5 million at the time of the 2010 census and if we grow by 5% per year, we would exceed 850 million in 2110. Looking at the population of countries at the present, only China and India are larger. This is a far larger population than the entire United States is expected to have by 2100.
- Future population change could be precisely predicted if you could accurately determine the components of population change: births, deaths, and migration
- Limited number of components of population change (births, deaths and migration), however rates vary significantly by group and are not stable over time. For example fertility rates for Hispanic women are higher for most ages than for other race/ethnic groups; and migration flows do not reflect the general age of the existing population.

- Each component can be understood, but people are unpredictable, which makes understanding future change less than certain.
- Many countries in Europe and other parts of the world have very low fertility rates; as the baby boomers age then die, the population in these countries will decline, unless social and political norms change.
- In addition to social-cultural roles in population, the economy can have an impact, especially on migration. However, even these over-arching factors are not likely to overrule a state's carrying capacity or quality of life issues. It is unknown what will be the limiting factors in Arizona's growth, that is, it is difficult to predict a cap. A lack of water is a possibility, but only one possibility.
- Census data which are necessary as a base to project future population using a cohort-component model will not be available until summer, 2011. Commerce does not expect to finish working on a new set of population projections until 2012. That will allow us time to develop historical fertility trends, mortality (survival rates) and migration rates and to develop three scenarios of future Arizona populations. The key to these scenarios will be in understanding all of the assumptions that feed future components of change and underlie the projections.
- Given that the Water Resources Development Commission does not have the luxury of time to wait for the official population projections, we believe the approach used by the Department of Water Resources is reasonable. Specifically, Water Resources is considering a projection, which indicates a slowing rate of increase (and an eventual flattening) in Arizona future share's of the U.S. population. We believe that Arizona will continue to attract new residents, but as has been seen in other states (e.g., California and New York), the rate of growth is likely to decline.

Possible Methods for Spreading the State Projections over County and Water Basin Boundaries:

1. **County Breakdowns – simplistic way**: Freeze the ratio of the county projections to the state projection in 2055, regardless of which method is used to project the state population.
2. **Basin Breakdowns – simplistic way**: Freeze the atlas basin projection in 2050 and use that to project basin population out to 2110.
3. **Basin Breakdowns – more detailed analysis**: Extend projections from the water atlas out to 2110 using the growth function in Excel and the rate of growth from the DES projection by CDP through 2055, then sum up.