Chesapeake Bay Program | Indicator Analysis and Methods Document
Bay Watershed Population | *Updated [09/07/21]*

Indicator Title: Bay Watershed Population

Relevant Outcome(s): N/A

Relevant Goal(s): N/A

Location within Framework (i.e., Influencing Factor, Output or Performance): Influencing Factor

A. Data Set and Source

(1) Describe the data set. What parameters are measured? What parameters are obtained by calculation? For what purpose(s) are the data used?
- Data is collected for long-term monitoring.
- The 1950 – 2000 and 2010 data are based on decadal US Census Bureau data apportioned to the Bay watershed by the CBPO.
- The 2001 – 2009, and 2011 - 2020 data are based on the annual population estimates produced by the US Census Bureau apportioned to the Bay watershed by the CBPO.
- The 2030 and 2040 data are based on County population projections produced by each state and the Washington Council of Governments and apportioned to the Bay watershed by the CBPO. Data for 2050 are extrapolated from 2010-2040 to 2050.
- Population for all years is spatially apportioned from counties to the watershed based on the proportion of Census 2010 Block-level population within the watershed.

(2) List the source(s) of the data set, the custodian of the source data, and the relevant contact at the Chesapeake Bay Program.
- Source: See above
- Custodian: Peter Claggett, 410-267-5771, PClagget@chesapeakebay.net
- Chesapeake Bay Program Contact (name, email address, phone number): Peter Claggett, 410-267-5771, PClagget@chesapeakebay.net

(3) Please provide a link to the location of the data set. Are metadata, data-dictionaries and embedded definitions included? N/A; contact Peter Claggett, 443-370-5724, PClagget@chesapeakebay.net for more information.

B. Temporal Considerations

(4) Data collection date(s): See response to question 1 of this document.

(5) Planned update frequency (e.g., annual, biannual, etc.):
   - Source Data: annual
   - Indicator: annual

(6) Date (month and year) next data set is expected to be available for reporting: June 2022

C. Spatial Considerations

(7) What is the ideal level of spatial aggregation (e.g., watershed-wide, river basin, state, county, hydrologic unit code)? Entire watershed

(8) Is there geographic (GIS) data associated with this data set? If so, indicate its format (e.g., point, line polygon). The population data is a county spreadsheet that can be linked to county TIGER polygon files via common FIPS field.

(9) Are there geographic areas that are missing data? If so, list the areas. N/A

(10) Please submit any appropriate examples of how this information has been mapped or otherwise portrayed geographically in the past. N/A

D. Communicating the Data

(11) What is the goal, target, threshold or expected outcome for this indicator? How was it established? N/A

(12) What is the current status in relation to the goal, target, threshold or expected outcome? As of 2020, 18,404,022 people were estimated to live in the Bay watershed, up from 18,362,016 in 2019. Note that all inter-decennial census population estimates are revised annually until the next decennial census (e.g., year 2020). For example, the 2011-2019 estimates were revised with the release of the 2020 estimates. There is no goal, target, threshold, or expected outcome for this indicator.

(13) Has a new goal, target, threshold or expected outcome been established since the last reporting period? Why? N/A

(14) Has the methodology of data collection or analysis changed since the last reporting period? How? Why? N/A

(15) What is the long-term data trend (since the start of data collection)?

From 1950 through 2020, the Bay watershed's population increased from 8,380,319 to 18,404,022.

(16)   What change(s) does the most recent data show compared to the last reporting period? To what do you attribute the change? Is this actual cause or educated speculation? As of 2020, 18,404,022people were estimated to live in the Bay watershed, up from 18,362,016 in 2019. While the overall population of the Bay watershed continues to grow, population changes vary from state to state and region to region. Some areas are gaining population due to a combination of births, declining deaths, and migration, while populations in other areas are leveling out or declining.

(17) What is the key story told by this indicator?
Experts predict that the watershed's population will increase to over 22 million by the year 2050. This increase will likely have an impact on progress towards outcomes within the Chesapeake Bay Agreement, specifically land use-related outcomes, as the way humans use the land has the greatest impact on the Bay and local waterways. Natural areas like forests and wetlands have a positive effect on water quality, while areas developed for farming or cities generally have a negative impact.

Even more influential than population growth impacts to the Bay are the corresponding impacts from development. Trends from the 1950's to mid-2000's show people moving into sprawling suburbs and living in bigger houses on larger lots, causing forests, farms and other valuable lands to be transformed into subdivisions, shopping centers and parking lots. This land conversion severely impacts the health of streams, rivers and the Bay. More recent trends suggest a possible resurgence of growth in urbanized areas with an increasing proportion of new housing stock represented by multi-unit dwellings (as opposed to single-detached homes). This is a promising phenomenon because urbanized areas have infrastructure such as roads, schools, and sewer systems to support future growth while minimizing increases in impervious surfaces and wastewater discharges. Impervious surfaces such as roads, rooftops, and parking lots do not allow water to filter into the ground. Instead rainfall runs off, picking up pollution and quickly carrying it into waterways.

E. Adaptive Management
This indicator is a factor that influences other watershed actions and outcomes; the Partnership has not committed to managing Watershed population or population growth.

(18) What factors influence progress toward the goal, target, threshold or expected outcome? N/A

(19) What are the current gaps in existing management efforts? N/A

(20) What are the current overlaps in existing management efforts? N/A

(21) According to the management strategy written for the outcome associated with this indicator, how will we (a) assess our performance in making progress toward the goal, target, threshold or expected outcome, and (b) ensure the adaptive management of our work? N/A

F. Analysis and Interpretation
Please provide appropriate references and location(s) of documentation if hard to find.

(22) What method is used to transform raw data into the information presented in this indicator? Please cite methods and/or modeling programs.
For a discussion of the population allocation method, see Claggett, P. and C. Bisland, 2004, Assessing the vulnerability of forest and farmlands to development in the Chesapeake Bay watershed, in Proceedings of the IASTED International Conference on Environmental Modeling and Simulation, November 22-24, 2004, St. Thomas, U.S. Virgin Islands. Available at https://www.iasted.org/conferences/pastinfo-432.html.

(23) Is the method used to transform raw data into the information presented in this indicator accepted as scientifically sound? If not, what are its limitations?
There are many acceptable ways to apportion county population to watershed boundaries. We used a population and residential road weighted allocation method outlined in Claggett, P. and C. Bisland, 2004, Assessing the vulnerability of forest and farmlands to development in the Chesapeake Bay watershed, in Proceedings of the IASTED International Conference on Environmental Modeling and Simulation, November 22-24, 2004, St. Thomas, U.S. Virgin Islands.

(24) How well does the indicator represent the environmental condition being assessed? This indicator does not represent an environmental condition.

(25) Are there established reference points, thresholds, ranges or values for this indicator that unambiguously reflect the desired state of the environment? N/A

(26) How far can the data be extrapolated? Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?
Population projections are produced by state agencies or contractors to state agencies. These data are mostly based on Cohort-Component models or similar demographic models with estimates of births, deaths, domestic migration, and international migration. Some states update their projections annually (Maryland) but most update them every 3-6 years. Birth and death rates are more stable than migration patterns which vary based on relative employment opportunities and other factors. All states other than West Virginia have produced population projections through 2040. West Virginia only projected through 2030. The WV data

were linearly extrapolated from 2000-2030 to 2040 and 2050 for developing the Bay-wide estimates of population in 2040 and 2050.

G. Quality
Please provide appropriate references and location(s) of documentation if hard to find.

(27) Were the data collected and processed according to a U.S. Environmental Protection Agency-approved Quality Assurance Project Plan? If so, please provide a link to the QAPP and indicate when the plan was last reviewed and approved. **If not, please complete questions 29-31.** No.

(28) *If applicable:* Are the sampling, analytical and data processing procedures accepted as scientifically and technically valid? Yes.

(29) *If applicable:* What documentation describes the sampling and analytical procedures used?
Claggett, P. and C. Bisland, 2004, Assessing the vulnerability of forest and farmlands to development in the Chesapeake Bay watershed, in Proceedings of the IASTED International Conference on Environmental Modeling and Simulation, November 22-24, 2004, St. Thomas, U.S. Virgin Islands.

(30) *If applicable:* To what extent are procedures for quality assurance and quality control of the data documented and accessible? See above references.

(31) Are descriptions of the study design clear, complete and sufficient to enable the study to be reproduced? Yes.

(32) Were the sampling, analytical and data processing procedures performed consistently throughout the data record? Yes.

(33) If data sets from two or more sources have been merged, are the sampling designs, methods and results comparable? If not, what are the limitations?
Only the population projections were derived by different agencies using potentially different methods and slightly different assumptions. It is not yet known the degree to which the methods used by each state are comparable.

(34) Are levels of uncertainty available for the indicator and/or the underlying data set? If so, do the uncertainty and variability impact the conclusions drawn from the data or the utility of the indicator? No.

(35) For chemical data reporting: How are data below the MDL reported (i.e., reported as 0, censored, or as < MDL)? If parameter substitutions are made (e.g., using orthophosphate instead of total phosphorus), how are data normalized? How does this impact the indicator? N/A

(36) Are there noteworthy limitations or gaps in the data record? These data reflect the best available estimates of historical, current, and future population in the Bay watershed. The historical and projected data were apportioned to the Bay watershed based on 2010 spatial distributions of population. Historic and future population patterns may differ from 2010 conditions but those differences only affect counties that are bisected by the watershed boundary and such areas represent a very small percentage of the total watershed population.

**H. Additional Information (*Optional)*

(37) Please provide any further information you believe is necessary to aid in communication and prevent any potential misrepresentation of this indicator. N/A