



Photo by Steve Droter, Chesapeake Bay Program: <https://flic.kr/p/2eMDazG>

# Updates to Modeled Sewer and Septic Areas for the Phase 7 Watershed Model

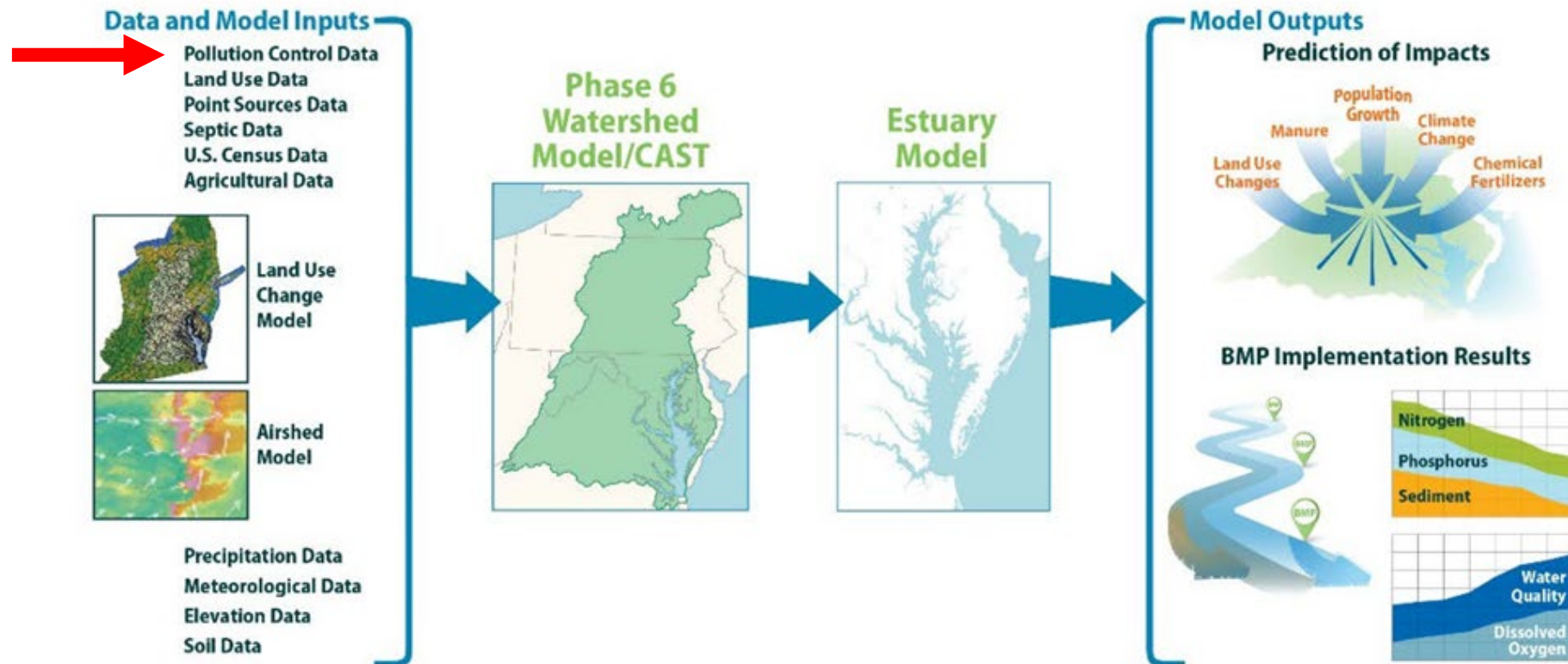
Joint Wastewater Treatment and Urban Stormwater Workgroup Meeting

Nov 2024

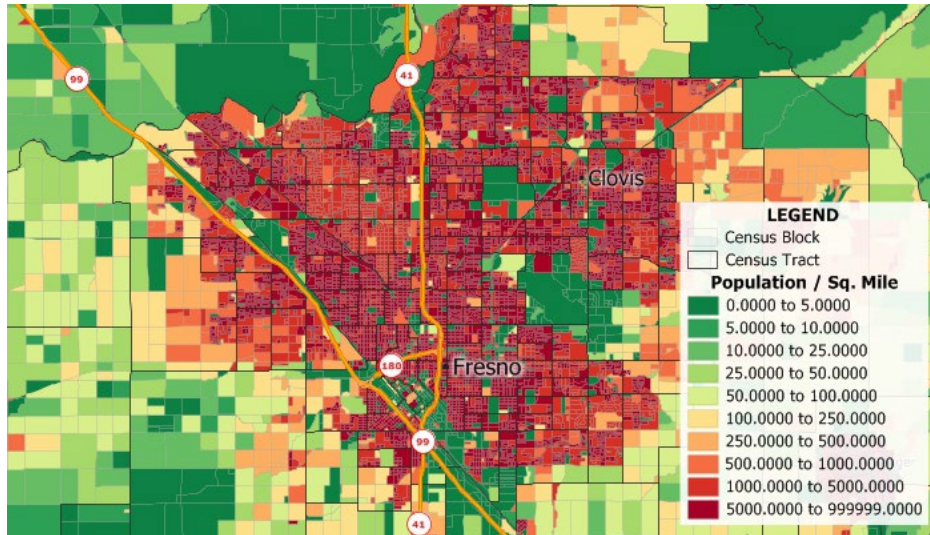


# Background/Context

The USGS models populations served by sewer and septic systems within the Chesapeake Bay Watershed from 1985 through future years (e.g., 2050) to inform the Chesapeake Bay Watershed Model and CAST.



# Updates to the Sewer/Septic Model



**Phase 6 Method:** modeled septic systems as single detached housing units in *census blocks* that fall outside of sewer service areas.



**[Proposed] Phase 7 Method:** model septic systems as developed residential *parcels* that fall outside of sewer service areas.

## Phase 7 Method

- ✓ Incorporates updated sewer service data from localities
- ✓ Captures areas where multiple families are living in a single detached housing unit (e.g., Northern Virginia)
- ✓ Improves accuracy by using parcels instead of census blocks (census blocks can change throughout time)



# Proposed Phase 7

## Methods: Septic

- Septic counts determined as any parcel that is
  - Developed
  - Non-commercial
    - Determined by new residential/commercial data layers derived from parcel data
  - Outside sewer service areas
  - Greater than or equal to 0.5 acres
- Septic Counts = 1 system per parcel
- Population on Septic = (# of systems) \* (average household size)
  - Average household size by block group - American Community Survey



Parcels outside sewer service areas that are greater than (or equal to) 0.5 acres and have non-commercial structures are **included**



“Commercial” developed parcels are **excluded** (in this case, a golf course)

Parcels with no buildings or structures are **excluded**

 = parcels tagged as septic



# Septic Methodology

- Method 1: Residential & Size Analysis
  - Includes all developed, non-commercial parcels that are greater than or equal to 0.5 acres outside sewer service areas
- Method 2: Residential Analysis
  - Includes all developed, non-commercial parcels outside sewer service areas
- Method 3: Commercial Analysis
  - Includes all developed, commercial parcels outside sewer service areas

# Comparison of DRAFT County Estimates for Septic (2017): Residential + Size Threshold Analysis

|       |                |       | Phase 6      |                      | Phase 7 (Draft) |                      | Total Difference between P6 & P7 |                      |
|-------|----------------|-------|--------------|----------------------|-----------------|----------------------|----------------------------------|----------------------|
| FIPS  | County         | State | Septic Count | Population on Septic | Septic Count    | Population on Septic | Septic Count                     | Population on Septic |
| 10001 | KENT           | DE    | 16,454       | 42,753               | 12,061          | 33,153               | -4,393                           | -9,600               |
| 10003 | NEW CASTLE     | DE    | 7,551        | 19,291               | 3,001           | 7,574                | -4,550                           | -11,717              |
| 10005 | SUSSEX         | DE    | 35,270       | 85,448               | 11,450          | 30,502               | -23,820                          | -54,946              |
| 24001 | ALLEGANY       | MD    | 4,756        | 9,920                | 4,367           | 10,614               | -389                             | 694                  |
| 24003 | ANNE ARUNDEL   | MD    | 41,778       | 107,742              | 11,624          | 32,210               | -30,154                          | -75,532              |
| 24005 | BALTIMORE      | MD    | 33,479       | 82,330               | 31,506          | 86,555               | -1,973                           | 4,225                |
| 24011 | CAROLINE       | MD    | 8,212        | 21,533               | 7,898           | 20,570               | -314                             | -963                 |
| 24013 | CARROLL        | MD    | 33,471       | 90,788               | 29,004          | 79,178               | -4,467                           | -11,610              |
| 24015 | CECIL          | MD    | 21,410       | 53,596               | 14,054          | 39,668               | -7,356                           | -13,928              |
| 24017 | CHARLES        | MD    | 18,021       | 49,414               | 11,258          | 32,075               | -6,763                           | -17,339              |
| 24019 | DORCHESTER     | MD    | 9,703        | 16,306               | 6,610           | 16,477               | -3,093                           | 171                  |
| 24021 | FREDERICK      | MD    | 28,717       | 76,866               | 26,830          | 72,155               | -1,887                           | -4,711               |
| 24023 | GARRETT        | MD    | 11,785       | 21,841               | 6,498           | 16,647               | -5,287                           | -5,194               |
| 24027 | HOWARD         | MD    | 16,927       | 46,021               | 9,201           | 27,982               | -7,726                           | -18,039              |
| 24029 | KENT           | MD    | 4,410        | 9,116                | 3,704           | 9,512                | -706                             | 396                  |
| 24031 | MONTGOMERY     | MD    | 19,991       | 53,887               | 12,708          | 37,550               | -7,283                           | -16,337              |
| 24033 | PRINCE GEORGES | MD    | 7,631        | 20,238               | 4,499           | 12,159               | -3,132                           | -8,079               |
| 24035 | QUEEN ANNES    | MD    | 10,984       | 27,442               | 8,359           | 23,082               | -2,625                           | -4,360               |
| 24037 | ST MARYS       | MD    | 27,465       | 67,988               | 12,147          | 33,830               | -15,318                          | -34,158              |
| 24039 | SOMERSET       | MD    | 5,002        | 9,746                | 1,673           | 4,097                | -3,329                           | -5,649               |
| 24041 | TALBOT         | MD    | 8,583        | 18,099               | 5,928           | 14,335               | -2,655                           | -3,764               |
| 24043 | WASHINGTON     | MD    | 20,199       | 49,469               | 9,194           | 24,337               | -11,005                          | -25,132              |
| 24045 | WICOMICO       | MD    | 19,374       | 48,143               | 10,898          | 29,589               | -8,476                           | -18,554              |
| 24047 | WORCESTER      | MD    | 6,776        | 15,201               | 5,546           | 14,915               | -1,230                           | -286                 |
| 51059 | FAIRFAX        | VA    | 9,701        | 26,515               | 16,872          | 50,856               | 7,171                            | 24,341               |

# Comparison of DRAFT State Estimates for Septic (2017): Residential + Size Threshold Analysis

|                      | Phase 6         |                         | Phase 7 (Draft) |                         | Total Difference<br>between P6 & P7 |                         |
|----------------------|-----------------|-------------------------|-----------------|-------------------------|-------------------------------------|-------------------------|
| State                | Septic<br>Count | Population<br>on Septic | Septic<br>Count | Population<br>on Septic | Septic<br>Count                     | Population<br>on Septic |
| DE                   | 59,275          | 147,492                 | 26,512          | 71,229                  | <b>-32,763</b>                      | <b>-76,263</b>          |
| MD                   | 358,674         | 895,686                 | 233,506         | 637,537                 | <b>-125,168</b>                     | <b>-258,149</b>         |
| VA (Fairfax<br>Only) | 9,701           | 26,515                  | 16,872          | 50,856                  | <b>7,171</b>                        | <b>24,341</b>           |



# Comparison of DRAFT County Estimates for Septic (2017): Residential Analysis

|       |                |       | Phase 6      |                      | Phase 7 (Draft) |                      | Total Difference between P6 & P7 |                      |
|-------|----------------|-------|--------------|----------------------|-----------------|----------------------|----------------------------------|----------------------|
| FIPS  | County         | State | Septic Count | Population on Septic | Septic Count    | Population on Septic | Septic Count                     | Population on Septic |
| 10001 | KENT           | DE    | 16,454       | 42,753               | 13,589          | 37,261               | -2,865                           | -5,492               |
| 10003 | NEW CASTLE     | DE    | 7,551        | 19,291               | 24,723          | 63,255               | 17,172                           | 43,964               |
| 10005 | SUSSEX         | DE    | 35,270       | 85,448               | 12,973          | 34,408               | -22,297                          | -51,040              |
| 24001 | ALLEGANY       | MD    | 4,756        | 9,920                | 4,655           | 11,317               | -101                             | 1,397                |
| 24003 | ANNE ARUNDEL   | MD    | 41,778       | 107,742              | 22,596          | 61,040               | -19,182                          | -46,702              |
| 24005 | BALTIMORE      | MD    | 33,479       | 82,330               | 34,324          | 94,307               | 845                              | 11,977               |
| 24011 | CAROLINE       | MD    | 8,212        | 21,533               | 8,529           | 22,191               | 317                              | 658                  |
| 24013 | CARROLL        | MD    | 33,471       | 90,788               | 31,585          | 86,223               | -1,886                           | -4,565               |
| 24015 | CECIL          | MD    | 21,410       | 53,596               | 16,944          | 47,102               | -4,466                           | -6,494               |
| 24017 | CHARLES        | MD    | 18,021       | 49,414               | 12,429          | 35,191               | -5,592                           | -14,223              |
| 24019 | DORCHESTER     | MD    | 9,703        | 16,306               | 7,093           | 17,661               | -2,610                           | 1,355                |
| 24021 | FREDERICK      | MD    | 28,717       | 76,866               | 32,769          | 87,988               | 4,052                            | 11,122               |
| 24023 | GARRETT        | MD    | 11,785       | 21,841               | 6,839           | 17,514               | -4,946                           | -4,327               |
| 24027 | HOWARD         | MD    | 16,927       | 46,021               | 9,391           | 28,607               | -7,536                           | -17,414              |
| 24029 | KENT           | MD    | 4,410        | 9,116                | 4,384           | 11,221               | -26                              | 2,105                |
| 24031 | MONTGOMERY     | MD    | 19,991       | 53,887               | 13,779          | 40,613               | -6,212                           | -13,274              |
| 24033 | PRINCE GEORGES | MD    | 7,631        | 20,238               | 5,071           | 13,822               | -2,560                           | -6,416               |
| 24035 | QUEEN ANNES    | MD    | 10,984       | 27,442               | 9,655           | 26,424               | -1,329                           | -1,018               |
| 24037 | ST MARYS       | MD    | 27,465       | 67,988               | 14,852          | 40,793               | -12,613                          | -27,195              |
| 24039 | SOMERSET       | MD    | 5,002        | 9,746                | 1,737           | 4,258                | -3,265                           | -5,488               |
| 24041 | TALBOT         | MD    | 8,583        | 18,099               | 6,666           | 16,159               | -1,917                           | -1,940               |
| 24043 | WASHINGTON     | MD    | 20,199       | 49,469               | 10,020          | 26,544               | -10,179                          | -22,925              |
| 24045 | WICOMICO       | MD    | 19,374       | 48,143               | 12,711          | 34,550               | -6,663                           | -13,593              |
| 24047 | WORCESTER      | MD    | 6,776        | 15,201               | 6,126           | 16,431               | -650                             | 1,230                |
| 51059 | FAIRFAX        | VA    | 9,701        | 26,515               | 19,467          | 58,847               | 9,766                            | 32,332               |

# Comparison of DRAFT State Estimates for Septic (2017): Residential Analysis

|                      | Phase 6         |                         | Phase 7 (Draft) |                         | Total Difference<br>between P6 & P7 |                         |
|----------------------|-----------------|-------------------------|-----------------|-------------------------|-------------------------------------|-------------------------|
| State                | Septic<br>Count | Population<br>on Septic | Septic<br>Count | Population<br>on Septic | Septic<br>Count                     | Population<br>on Septic |
| DE                   | 59,275          | 147,492                 | 51,285          | 134,924                 | <b>-7,990</b>                       | <b>-12,568</b>          |
| MD                   | 358,674         | 895,686                 | 272,155         | 739,956                 | <b>-86,519</b>                      | <b>-155,730</b>         |
| VA (Fairfax<br>Only) | 9,701           | 26,515                  | 19,467          | 58,847                  | <b>9,766</b>                        | <b>32,332</b>           |



# Comparison of DRAFT County Estimates for Septic (2017): Commercial Analysis

|       |                |       | Phase 6      |                      | Phase 7 (Draft) |                      |
|-------|----------------|-------|--------------|----------------------|-----------------|----------------------|
| FIPS  | County         | State | Septic Count | Population on Septic | Septic Count    | Population on Septic |
| 10001 | KENT           | DE    | 16,454       | 42,753               | 203             | 544                  |
| 10003 | NEW CASTLE     | DE    | 7,551        | 19,291               | 2,413           | 5,796                |
| 10005 | SUSSEX         | DE    | 35,270       | 85,448               | 86              | 229                  |
| 24001 | ALLEGANY       | MD    | 4,756        | 9,920                | 93              | 225                  |
| 24003 | ANNE ARUNDEL   | MD    | 41,778       | 107,742              | 317             | 873                  |
| 24005 | BALTIMORE      | MD    | 33,479       | 82,330               | 648             | 1,762                |
| 24011 | CAROLINE       | MD    | 8,212        | 21,533               | 208             | 530                  |
| 24013 | CARROLL        | MD    | 33,471       | 90,788               | 607             | 1,676                |
| 24015 | CECIL          | MD    | 21,410       | 53,596               | 347             | 947                  |
| 24017 | CHARLES        | MD    | 18,021       | 49,414               | 232             | 675                  |
| 24019 | DORCHESTER     | MD    | 9,703        | 16,306               | 205             | 501                  |
| 24021 | FREDERICK      | MD    | 28,717       | 76,866               | 328             | 880                  |
| 24023 | GARRETT        | MD    | 11,785       | 21,841               | 204             | 526                  |
| 24027 | HOWARD         | MD    | 16,927       | 46,021               | 169             | 506                  |
| 24029 | KENT           | MD    | 4,410        | 9,116                | 115             | 284                  |
| 24031 | MONTGOMERY     | MD    | 19,991       | 53,887               | 182             | 523                  |
| 24033 | PRINCE GEORGES | MD    | 7,631        | 20,238               | 80              | 219                  |
| 24035 | QUEEN ANNES    | MD    | 10,984       | 27,442               | 273             | 762                  |
| 24037 | ST MARYS       | MD    | 27,465       | 67,988               | 202             | 542                  |
| 24039 | SOMERSET       | MD    | 5,002        | 9,746                | 43              | 102                  |
| 24041 | TALBOT         | MD    | 8,583        | 18,099               | 131             | 330                  |
| 24043 | WASHINGTON     | MD    | 20,199       | 49,469               | 116             | 318                  |
| 24045 | WICOMICO       | MD    | 19,374       | 48,143               | 245             | 651                  |
| 24047 | WORCESTER      | MD    | 6,776        | 15,201               | 187             | 498                  |
| 51059 | FAIRFAX        | VA    | 9,701        | 26,515               | 105             | 326                  |

# Comparison of DRAFT State Estimates for Septic (2017): Commercial Analysis

|                   | Phase 6      |                      | Phase 7 (Draft) |                      |
|-------------------|--------------|----------------------|-----------------|----------------------|
| State             | Septic Count | Population on Septic | Septic Count    | Population on Septic |
| DE                | 59,275       | 147,492              | 2,702           | 6,569                |
| MD                | 358,674      | 895,686              | 4,932           | 13,330               |
| VA (Fairfax Only) | 9,701        | 26,515               | 105             | 326                  |



# Validating Results:

How do the proposed Phase 7 methods align with jurisdictional data?

| Total Septic Count: Fairfax County |            |                                 |                          |
|------------------------------------|------------|---------------------------------|--------------------------|
| NVRC data                          | P6 Methods | P7 Methods (Residential + Size) | P7 Methods (Residential) |
| 21,455                             | 9,701      | 16,872                          | 19,467                   |



- = septic point data from Northern Virginia Regional Commission (NVRC)
- = P7 sewer service area
- = P7 septic parcels (developed non-commercial parcels ≥ 0.5 acres)

## Additional thoughts on methodology

- The more quality “truth” data we have for septics, the better!!
- Important to have updated sewer service area maps
- Opportunities to incorporate other available data, such as:
  - Attenuation factor based on septic location
  - Streams and/or soil data
  - Septic system types



# Discussion & Next Steps

- **No decision requested today – we are still finalizing methods.** At a future meeting, the WWTWG and USWG will be asked to approve the updated methods for septic and sewer service areas for the Phase 7 Watershed Model.
- **Action:** If jurisdictions have septic data for their states or localities, please email Jackie ([jpickford@chesapeakebay.net](mailto:jpickford@chesapeakebay.net)). These data will be used to validate the model results and/or refine methods.
- **Action:** Jackie will notify the WWTWG & USWG when the sewer service area data is posted on the web viewer for review and feedback.