Turfgrass Fertilizer
New Data for CAST ‘19

Jeff Sweeney
Environmental Protection Agency
Chesapeake Bay Program Office
sweeney.jeff@epa.gov
410-267-9844

Urban Stormwater Workgroup Meeting
September 17, 2019
Methods for the developed sector prescribe a mass of fertilizer nutrients for each state distributed to one “crop” type = turfgrass

- Methods capture variability among states for rural versus suburban.
- Using fertilizer data that has other utilities nation-wide
Turfgrass Nutrient Applications
Phase 6 Model

• Source for fertilizer nutrient mass is AAPFCO with methods to fill in holes in the data, such as when a county didn’t report, or the sales data were not split between Farm and Non-Farm
  • Same source as chemical fertilizer data for agriculture sector
Turfgrass Nutrient Applications
Phase 6 Model

• Two components to the application rates (lbs/acre)
  1) Fertilizer mass
  2) Turfgrass acres
    ▪ For back-cast, high-resolution land cover w/ USGS’s Landsat processing center’s back-casting methodology for land cover change 1984-2013 annual
    ▪ Land Use Workgroup + CBP office working on land use forecast with new data
Additional credit is given for practices that make up nutrient management – depending on high-risk, low-risk, blended.

The USWG approved the methods to vary nutrient application on developed lands for the Phase 6 model by jurisdiction and through time, 6/21/16.

- USWG will review new data at their 9/17/19 meeting.
Turfgrass Fertilizer
Nitrogen
Non-Farm Nitrogen Fertilizer Sales
1987 - 2006

- DE
- MD
- NY
- PA
- VA
- WV
- DC

Sales are represented in millions of pounds for the years 1987 to 2006.
Non-Farm Nitrogen Fertilizer

CAST ‘17

Linear regression of data through 2006

2006-2013 = projection

Post-2013 held constant

million lbs
Maryland Non-Farm Nitrogen Fertilizer Sales
1987 - 2014
Pennsylvania Non-Farm Nitrogen Fertilizer Sales
1988 - 2014

million lbs

Virginia Non-Farm Nitrogen Fertilizer Sales
1987 - 2012
New York Non-Farm Nitrogen Fertilizer Sales
1990 - 2014
Delaware Non-Farm Nitrogen Fertilizer Sales
1988 - 2014
West Virginia Non-Farm Nitrogen Fertilizer Sales
1988 - 2014
Non-Farm Phosphorus Fertilizer

CAST ‘17

Linear regression of data through 2006

2006-2013 = projection

Post-2013 held constant

million lbs
Maryland Non-Farm Phosphorus Fertilizer Sales
1987 - 2014
Pennsylvania Non-Farm Phosphorus Fertilizer Sales
1988 - 2014
Virginia Non-Farm Phosphorus Fertilizer Sales
1987 - 2012
New York Non-Farm Phosphorus Fertilizer Sales
1990 - 2014
Delaware Non-Farm Phosphorus Fertilizer Sales
1988 - 2014
West Virginia Non-Farm Phosphorus Fertilizer Sales
1988 - 2014
• Urban Stormwater Workgroup will decide what trend to use that incorporates the new fertilizer data.
# Turfgrass Nutrient Applications
## Phase 6 Model

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Statewide with P fertilizer legislation</th>
<th>Statewide without P fertilizer legislation</th>
<th>Urban Nutrient Management UNM²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus</td>
<td>25%</td>
<td>20%</td>
<td>Low risk: 3% High risk: 10% Blended: 4.5%</td>
</tr>
<tr>
<td>Notes &amp; Conditions of Credit</td>
<td>Effective 2013 for 3 years. In 2016, need to show reduction in P using two years of fertilizer sales data</td>
<td>Need to survey high-risk every 5 years; Renew UNM every 3 years</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nitrogen</th>
<th>For States with N fertilizer legislation: 9% reduction for qualifying acres by commercial applicators, 4.5% reduction for do-it-yourselfer acres</th>
<th>Low risk: 6% High risk: 20% Blended: 9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes &amp; Conditions of Credit</td>
<td>Effective 2014, need to show N reduction using two consecutive years sales data</td>
<td>Need to survey high-risk every 5 years; Renew UNM every 3 years</td>
</tr>
</tbody>
</table>

Changes in application rates over time (as an impact of nutrient management) would be captured by sales data.

Must be an actual plan or homeowner pledge.
Increasing nutrient mass on turfgrass does not necessarily mean increasing loads.

Load changes primarily depend on the relationship of the rate of change of nutrient mass to the rate of change of the turfgrass acres.
2) What would be the TN and TP fertilizer application rates under the proposed revisions to the AAPFCO state data?
1) What are the TN and TP fertilizer application rates under the current set of AAPFCO state data? These were set in the Phase 6 model on a state-by-state basis, with each county in a state having the same application rates. (We calculated the VA, MD and DC rates below.)

### Turfgrass Nutrient Applications
From K. Berger

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Columbia, DC</td>
<td>11612.05</td>
<td>248210.74</td>
<td>21.38</td>
<td>42553.70</td>
<td>3.66</td>
</tr>
<tr>
<td>Charles, MD</td>
<td>30622.03</td>
<td>570113.62</td>
<td>18.62</td>
<td>82620.84</td>
<td>2.70</td>
</tr>
<tr>
<td>Frederick, MD</td>
<td>58395.86</td>
<td>1087200.37</td>
<td>18.62</td>
<td>157557.02</td>
<td>2.70</td>
</tr>
<tr>
<td>Montgomery, MD</td>
<td>86911.44</td>
<td>1618096.71</td>
<td>18.62</td>
<td>234494.48</td>
<td>2.70</td>
</tr>
<tr>
<td>Prince Georges, MD</td>
<td>77496.38</td>
<td>1442809.26</td>
<td>18.62</td>
<td>209091.84</td>
<td>2.70</td>
</tr>
<tr>
<td>Alexandria, VA</td>
<td>3169.77</td>
<td>68171.26</td>
<td>21.51</td>
<td>13108.53</td>
<td>4.14</td>
</tr>
<tr>
<td>Arlington, VA</td>
<td>5846.87</td>
<td>125746.62</td>
<td>21.51</td>
<td>24179.60</td>
<td>4.14</td>
</tr>
<tr>
<td>Fairfax City, VA</td>
<td>1562.23</td>
<td>33598.33</td>
<td>21.51</td>
<td>6460.56</td>
<td>4.14</td>
</tr>
<tr>
<td>Fairfax, VA</td>
<td>77172.91</td>
<td>1659731.49</td>
<td>21.51</td>
<td>319146.88</td>
<td>4.14</td>
</tr>
<tr>
<td>Falls Church City, VA</td>
<td>463.31</td>
<td>9964.19</td>
<td>21.51</td>
<td>1916.00</td>
<td>4.14</td>
</tr>
<tr>
<td>Loudoun, VA</td>
<td>57788.22</td>
<td>1242831.57</td>
<td>21.51</td>
<td>238981.92</td>
<td>4.14</td>
</tr>
<tr>
<td>Manassas City, VA</td>
<td>3213.27</td>
<td>69106.61</td>
<td>21.51</td>
<td>13288.39</td>
<td>4.14</td>
</tr>
<tr>
<td>Manassas Park City, VA</td>
<td>766.63</td>
<td>16487.57</td>
<td>21.51</td>
<td>3170.37</td>
<td>4.14</td>
</tr>
<tr>
<td>Prince William, VA</td>
<td>42635.08</td>
<td>916938.17</td>
<td>21.51</td>
<td>176316.45</td>
<td>4.14</td>
</tr>
</tbody>
</table>
3) What are the sensitivities to TN and TP urban fertilizer application in the model? 

The sensitivity to TN urban fertilizer is relatively low (about 0.06), which means even relatively large changes in pounds applied will have a small impact on estimated urban loads. The sensitivity to TP urban fertilizer is somewhat higher (0.20 – 0.25), which would mean changes to the TP application rate would have a bigger impact.
Water Quality Standards Attainment

![Graph showing water quality standards attainment over time.](image-url)