Final Scenario Results for the Draft WIP

Healthy Waters, Healthy Communities
Pennsylvania Phase 3 Watershed Implementation Plan (WIP3)

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Chesapeake Bay Program
Phase 3 Watershed Implementation Plan

Outline

• Pennsylvania’s Progress to Date
• Bay Goals and Local Goals
• Moving from 2017 to 2025
• Joining the Individual Workgroup Scenarios
• Pennsylvania-wide Workgroup Reductions
• Countywide Action Plans
• Summary
Pennsylvania has made progress in reducing its Nitrogen load to the Chesapeake Bay since 1985.

Loading rates in 2017 show 107.31 M lbs of Nitrogen annually, a reduction of 14.71 M lbs since 1985. The planning target for Nitrogen is 73.18 M lbs of Nitrogen annually.
Pennsylvania has made significant progress in reducing its Phosphorous load to the Chesapeake Bay since 1985.

Loading rates for Phosphorous show 3.80 M lbs annually, a reduction of 2.25 M lbs since 1985. The planning target for Phosphorous is 3.044 M lbs of Phosphorous annually.
Only a portion of the nutrients and sediment in PA’s local waters actually make it to the Bay
We can back track the reductions necessary in the Bay to determine reductions necessary in PA’s Local Waters.
Bay Goals and Local Waters Goals

We can back track the reductions necessary in the Bay to determine reductions necessary in PA’s Local Waters.

What matters for the Bay TMDL and what is submitted in WIP:

- What’s entering PA Local Waters from PA Land
- Reductions needed for PA Local Waters
- Reductions needed for Bay for TMDL

What’s making it to Chesapeake Bay from PA Land
Bay Goals and Local Waters Goals

We can back track the reductions necessary in the Bay to determine reductions necessary in PA’s Local Waters.

What’s entering PA Local Waters from PA Land

Reductions needed for PA Local Waters

What matters for PA’s local waters and the focus of Workgroup recommendations and Countywide Action Plans.
Bay Goals and Local Waters Goals

All statewide results, individual workgroup recommendations, and county action plan reductions can be reported as either of these:

- Reductions to Bay
- Reductions to PA’s Local Waters
Bay Goals and Local Waters Goals

Reductions necessary to PA’s Local Waters and the Bay

51.06 M lbs of N
2.02 M lbs of P

34.13 M lbs of N
0.756 M lbs of P
Bay Goals and Local Waters Goals

**Progress Since 1985**
Pennsylvania has made significant progress in reducing both its nitrogen and phosphorus load to the Chesapeake Bay since 1985.

- **Nitrogen**
  - 1985 Load (lbs): 112.02 M
  - 2017 Load (lbs): 5.80 M
  - 1985-2017 Reduction (lbs): 106.22 M

- **Phosphorus**
  - 1985 Load (lbs): 6.05 M
  - 2017 Load (lbs): 0.25 M
  - 1985-2017 Reduction (lbs): 5.80 M

**2025 Reduction Goal**
Pennsylvania needs to reduce its annual nutrient load for nitrogen and phosphorus by 2025.

- **Nitrogen**
  - 2025 Goal (lbs): 73.18 M
  - 2017 Load (lbs): 107.31 M

- **Phosphorus**
  - 2025 Goal (lbs): 3.04 M
  - 2017 Load (lbs): 5.80 M

**Existing Resources**
If Pennsylvania was to continue to improve with existing programs and resources, it would fall short of the 2025 planning goal by 23.93 M lbs of nitrogen.

- **Pennsylvania's Trending Nitrogen Load to the Bay**
  - Planning Target: 24.94 M lbs
  - Load in 2017: 107.31 M lbs
  - Projected Nitrogen Load in 2025: 73.18 M lbs

**Local Waters Goals**

**Progress Since 1985**
Pennsylvania has made significant progress in reducing both its nitrogen and phosphorus load to the Chesapeake Bay since 1985.

- **Nitrogen**
  - 1985 Load (lbs): 13.84 M
  - 2017 Load (lbs): 9.64 M

- **Phosphorus**
  - 1985 Load (lbs): 2.02 M
  - 2017 Load (lbs): 1.21 M
  - 1985-2017 Reduction (lbs): 0.81 M

**2025 Reduction Goal**
Pennsylvania's 2025 nutrient reduction goals for nitrogen and phosphorus are aggressive and achievable.

- **Nitrogen**
  - 2025 Goal (lbs): 11.38 M
  - 2017 Load (lbs): 161.94 M

- **Phosphorus**
  - 2025 Goal (lbs): 9.64 M
  - 2017 Load (lbs): 110.88 M

**Existing Resources**
If Pennsylvania was to continue to improve with existing programs and resources, it would fall short of the 2025 planning goal by 36.13 M lbs of nitrogen.

- **Pennsylvania's Trending Nitrogen Load to the Local Waters**
  - Planning Target: 24.94 M lbs
  - Load in 2017: 161.94 M lbs
  - Projected Nitrogen Load in 2025: 11.38 M lbs

This achievement requires ongoing work to improve Pennsylvania's nutrient reduction goals for both nitrogen and phosphorus.
Progress Since 1985:
- PA has reduced 12% of its Nitrogen load since 1985

The Current Approach (Nitrogen):
- The forecasted trend was calculated using the average reduction per year over the last five years (2012 – 2017)
- The current trend will leave Pennsylvania 36.13 M lbs of Nitrogen short of the 2025 goal
- It would take until 2044 to meet the WIP Planning Target
Pennsylvania’s Local Waterways Goal

2025 Reduction Goal:
- PA needs to reduce 51.06 M lbs of Nitrogen

The Current Approach (Nitrogen):
- The forecasted trend was calculated using the average reduction per year over the last five years (2012 – 2017)
- The current trend will leave Pennsylvania 36.13 M lbs of Nitrogen short of the 2025 goal
- It would take until 2044 to meet the WIP Planning Target

Pennsylvania’s Trending Nitrogen Load to the Bay

2017 Load (lbs): 161.94 M
2025 Goal (lbs): 110.88 M
Pennsylvania’s Local Waterways Goal

Progress Since 1985:
- PA has reduced 35% of its Phosphorus load since 1985

The Current Approach (Phosphorus):
- For phosphorus the 5-year time span experienced aggressive reductions compared to all previous five-year increments
- If this trend continues, PA will meet the 2025 WIP Planning Target
Pennsylvania’s Local Waterways Goal

2025 Reduction Goal:
- PA needs to reduce 2.02 M lbs of Phosphorus

The Current Approach (Phosphorus):
- For phosphorus the 5-year time span experienced aggressive reductions compared to all previous five-year increments
- If this trend continues, PA will meet the 2025 WIP Planning Target

Phosphorus (P)
Reduction Goal (lbs):
2025 Goal (lbs): 2.02 M

Reduction Goal (lbs):
21%

2017 Load (lbs): 9.64 M
2025 Goal (lbs): 7.62 M

Pennsylvania’s Trending Phosphorus Load to the Local Waterways
**Pennsylvania’s Bay Goals**

**Progress Since 1985:**
- PA has reduced 12% of its Nitrogen load to the Bay
- PA has reduced 37% of its Phosphorus load to the Bay

**2025 Reduction Goal:**
- PA needs to reduce 34.13 M lbs of Nitrogen to the Bay
- PA needs to reduce 0.756 M lbs of Phosphorous to the Bay
The Current Approach:
- The current trend will leave Pennsylvania 23.63 M lbs of Nitrogen short of the 2025 goal
- It would take until 2044 to meet the WIP Nitrogen Planning Target
- Phosphorus (not shown) would meet WIP Target on current trajectory
Why are we using 2025?

- TMDL specifies need to account for growth in different sectors across the timeline of the TMDL subsequent changes in loads.
- For Phase III WIP we now have the estimates of growth (Land Change Model).
- Jurisdictions chose to “bake in” accounting for growth into their WIPs by running their final WIP scenarios on 2025 estimated land use.
Why is there a difference between 2017 and 2025?

Change in PA Chesapeake Bay Watershed Acres between 2017-2025

- Natural
- Developed
- Agriculture
Why is there a difference between 2017 and 2025?

Change in PA Chesapeake Bay Watershed Acres from 2017 to 2025

- Developed
- Other Ag
- Pasture
- Hay
- Crop
- Feeding Space
- Open Space
- Forest/Wetland

Acres
Why is there a difference between 2017 and 2025?

Change in PA Chesapeake Bay Watershed Nitrogen loads from 2017 to 2025

- Developed
- Other Ag
- Pasture
- Hay
- Crops
- Feeding Space
- Open Space
- Forest/Wetlands

Lbs

-800000 -600000 -400000 -200000 0 200000 400000 600000
Moving from 2017 to 2025

Agricultural Workgroup Recommendations

<table>
<thead>
<tr>
<th>Year</th>
<th>Nitrogen Reductions</th>
<th>Phosphorus Reductions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Land Use with Forest Buffers Included</td>
<td>33.3 M lbs (65% of PA Goal)</td>
<td>2.15 M lbs (106% of PA Goal)</td>
<td>$327 M</td>
</tr>
<tr>
<td>2017 Land Use with Forest Buffers Moved to Forestry Scenario</td>
<td>28.8 M lbs (56% of PA Goal)</td>
<td>1.8 M lbs (89% of PA Goal)</td>
<td>$302 M</td>
</tr>
<tr>
<td>2025 Land Use with Forest Buffers Moved to Forestry Scenario</td>
<td>28.6 M lbs (56% of PA Goal)</td>
<td>1.8 M lbs (89% of PA Goal)</td>
<td>$313 M</td>
</tr>
</tbody>
</table>
Moving from 2017 to 2025

Stormwater Workgroup Recommendations

<table>
<thead>
<tr>
<th>Year</th>
<th>Nitrogen Reductions</th>
<th>Phosphorus Reductions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Land Use (Not including 2023 Permit Cycle)</td>
<td>293,000 lbs (1% of PA Goal)</td>
<td>38,000 lbs (2% of PA Goal)</td>
<td>$78.6 M</td>
</tr>
<tr>
<td>2025 Land Use (Not including 2023 Permit Cycle)</td>
<td>296,000 lbs (1% of PA Goal)</td>
<td>39,250 lbs (2% of PA Goal)</td>
<td>$78.6 M</td>
</tr>
<tr>
<td>2025 Land Use (Including 2023 Permit Cycle)</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Moving from 2017 to 2025

Forestry Workgroup Recommendations

<table>
<thead>
<tr>
<th>Nitrogen Reductions</th>
<th>Phosphorus Reductions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.70 M lbs</td>
<td>1.02 M lbs</td>
<td>$67.7 M</td>
</tr>
<tr>
<td>15% of PA Goal</td>
<td>51% of PA Goal</td>
<td></td>
</tr>
</tbody>
</table>

2017 Land Use (Forest Buffers Included)

7.70 M lbs
15% of PA Goal

1.02 M lbs
51% of PA Goal

$67.7 M

2025 Land Use (Including Forest Buffers)

7.68 M lbs
15% of PA Goal

1.03 M lbs
50% of PA Goal

$67.7 M
## Workgroup Recommendations Summary

### Reductions to PA Local Waters from Workgroup Recommendations

<table>
<thead>
<tr>
<th>Workgroup</th>
<th>Nitrogen (lbs)</th>
<th>Phosphorous (lbs)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture(^\text{\small{a}})</td>
<td>28,572,000 (56%)</td>
<td>1,790,000 (87%)</td>
<td>$313,140,000</td>
</tr>
<tr>
<td>Forestry</td>
<td>7,681,000 (15%)</td>
<td>1,029,000 (50%)</td>
<td>$67,701,000</td>
</tr>
<tr>
<td>Stormwater(^\text{\small{a}})</td>
<td>296,000 (1%)</td>
<td>39,250 (2%)</td>
<td>$78,552,000</td>
</tr>
</tbody>
</table>

\(^\text{\small{a}}}\)Recommendations do not include 2023 Permit Cycle

\(^\text{\small{a}}}\)Reductions do not contain forest buffers: the Forestry scenario contains the Agriculture forest buffers
From WG Recommendations to Statewide Scenario

- The total reductions statewide for PA are not simply the sum of the individual workgroup recommendation reductions.
- Workgroup recommendation scenarios are run independently of each other with only the suite of BMPs specific to that workgroup.
- In reality, and in the model, BMPs interact with each other.
- A statewide scenario must be run with all of the workgroup-recommended suites of BMPs together to get an appropriate estimate of reductions.

### Reductions to PA Local Waters from Workgroup Recommendations

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^Recommendations do not include 2023 Permit Cycle
*Reductions do not contain forest buffers: the Forestry scenario contains the Agriculture forest buffers
From WG Recommendations to Statewide Scenario

• Example: Forest Buffers & Other Ag BMPs
• Simply summing the Forestry and Ag WG scenario reductions together allows for both forest buffers and BMPs like cover crops to exist on the same strip of land
• In reality, one a forest buffer is put in, that streamside land is no longer available for cover crops
• Running the BMPs all together accounts for this interaction
• Simply summing the scenarios would over-estimate reductions by counting both separately

### Reductions to PA Local Waters from Workgroup Recommendations

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*Recommendations do not include 2023 Permit Cycle
^Reductions do not contain forest buffers: the Forestry scenario
...contains the Agriculture forest buffers
2025 Land Use (All WG Scenarios combined)

<table>
<thead>
<tr>
<th>Nitrogen Reductions</th>
<th>Phosphorus Reductions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.2 M lbs</td>
<td>2.12 M lbs</td>
<td>$459 M</td>
</tr>
<tr>
<td>65% of PA Goal</td>
<td>104% of PA Goal</td>
<td></td>
</tr>
</tbody>
</table>
2025 Land Use (All WG Scenarios combined)

- Nitrogen (N) Statewide Reductions (lbs): 33.24 M
  - Remaining "Gap" (lbs)
  - Workgroup Reductions (lbs) 65%

- Phosphorous (P) Statewide Reductions (lbs): 2.12 M
  - 104%
PA Statewide Scenario Reductions to the Bay

2025 Land Use (All WG Scenarios combined)

<table>
<thead>
<tr>
<th>Nitrogen Reductions</th>
<th>Phosphorus Reductions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.4 M lbs 66% of PA Goal</td>
<td>0.89 M lbs 118% of PA Goal</td>
<td>$459 M</td>
</tr>
</tbody>
</table>
PA Statewide Scenario Reductions to the Bay

2025 Land Use (All WG Scenarios combined)

Nitrogen (N) Statewide Reductions (lbs): 22.37 M

- Remaining "Gap" (lbs)
- Workgroup Reductions (lbs)

Nitrogen (N) Statewide Reductions (lbs): 22.37 M
- 66%

Phosphorous (P) Statewide Reductions (lbs): 0.893 M
- 118%
This bar chart shows the progress to date in each of Pennsylvania’s Chesapeake Bay Counties.

The purple bar represents the nitrogen reductions since 1985, and the orange bar represents the additional nitrogen reduction goals by 2025.

Some counties have more work than others, but each county has to do its portion for Pennsylvania to be successful.
This bar chart shows the progress to date in each of Pennsylvania’s Chesapeake Bay Counties.

The purple bar represents the nitrogen reductions since 1985, and the orange bar represents the additional nitrogen reduction goals by 2025.

Some counties have more work than others, but each county has to do its portion for Pennsylvania to be successful.
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The purple bar represents the phosphorous reductions since 1985, and the orange bar represents the additional phosphorous reduction goals by 2025.

Some counties have more work than others, but each county has to do its portion for Pennsylvania to be successful.
This bar chart shows how the statewide workgroup recommendations merge with the Countywide Action Plans.

The purple bar represents the nitrogen reductions since 1985. The green bar represents the state workgroup recommendations reductions. The blue bar represents a completed Countywide Action Plan. The red bar represents the remaining gap between the county plan and the 2025 goal.
The remaining 39 counties will use the state workgroup recommendations as a starting place for beginning their Countywide Action Plan. As each county completes its plan their bar will be updated to represent the results of the planning process. A completed plan will shift to blue and represent a completed Countywide Action Plan.
The purple bar represents the nitrogen reductions since 1985. The green bar represents the state workgroup recommendations reductions. The blue bar represents a completed Countywide Action Plan. The red bar represents the remaining gap between the county plan and the 2025 goal.
The **purple bar** represents the nitrogen reductions since 1985. The **green bar** represents the state workgroup recommendations reductions. The **blue bar** represents a completed Countywide Action Plan. The **red bar** represents the remaining gap between the county plan and the 2025 goal.
Countywide Phosphorous Goals (to Local Waters)

This chart shows how the statewide workgroup recommendations merge with the Countywide Action Plans.

The remaining 39 counties will use the state workgroup recommendations as a starting place for beginning their Countywide Action Plan. As each county completes its plan their bar will be updated to represent the results of the planning process. A completed plan will shift to **bold** and represent a completed Countywide Action Plan.

The total state recommendation on the bottom line will change based on the success of the Countywide Action Plans. With the help of the pilot counties Pa’s nitrogen reduction increased 1%.

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### Pennsylvania Statewide Workgroup Recommendations at the County Scale

<table>
<thead>
<tr>
<th>Total Nitrogen and Phosphorus Reductions Local Waterways vs. Bay Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>County</strong></td>
</tr>
<tr>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Lancaster*</td>
</tr>
<tr>
<td>York*</td>
</tr>
<tr>
<td>Franklin*</td>
</tr>
<tr>
<td>Lebanon</td>
</tr>
<tr>
<td>Cumberland</td>
</tr>
<tr>
<td>Centre</td>
</tr>
<tr>
<td>Bedford</td>
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<tr>
<td>Adams*</td>
</tr>
<tr>
<td>Northumberland</td>
</tr>
<tr>
<td>Perry</td>
</tr>
<tr>
<td>Snyder</td>
</tr>
<tr>
<td>Huntingdon</td>
</tr>
<tr>
<td>Columbia</td>
</tr>
<tr>
<td>Mifflin</td>
</tr>
</tbody>
</table>
1. WIP focuses on the Bay | Countywide Action Plans focus on local waterways

2. 2025 changes the Land Use, which slightly influences both loads and reductions

3. Merged workgroup recommendations into statewide scenario

4. Countywide Action Plans Merge with Workgroup Recommendations
Total Pilot Counties Implementation Results

In summary if the Pilot Counties’ Countywide Action Plans are implemented as drafted...

Nutrient Reductions in Pilot Countywide Action Plans
Action: Pilot counties are successful in fully implementing their Countywide Action Plans.

Total Estimated Cost: $344 million (Over the next six years)

- Nitrogen runoff reduced by 14.6 M lbs or 29% of PA’s Goal
- Phosphorus runoff reduced by 715,000 lbs or 35% of PA’s Goal

Total Sediment Reductions = 811,000,000 lbs

The Pilot Counties represent 19.9 M lbs or 39% of PA’s nitrogen goal, and 0.61 M lbs or 30% of PA’s phosphorous goal.
In summary if all the workgroup recommendations and current count action plans are implemented as drafted...

Cumulative Results of Recommended BMP Implementation

Action: All of the listed recommendations that we have reduction estimates for are implemented in PA’s Bay watershed counties.

- Nitrogen runoff reduced by 33.8 M lbs/yr or 66% of PA’s Goal
- Phosphorus runoff reduced by 2.0 M lbs/yr or 98% of PA’s Goal
In summary if all the workgroup recommendations and current count action plans are implemented as drafted...

**Cumulative Results of Recommended BMP Implementation**

Action: All of the listed recommendations that we have reduction estimates for are implemented in PA’s Bay watershed counties.

- **Nitrogen runoff reduced by** 22.6 M lbs/yr or 66% of PA’s Goal
- **Phosphorus runoff reduced by** 824,000 lbs/yr or 109% of PA’s Goal
Questions?
Contact Information: Emily Trentacoste
trentacoste.emily@epa.gov

Contact Information: Jordan Baker
c-jorbaker@pa.gov

DEP Chesapeake Bay Program Website:
http://www.dep.pa.gov/ChesapeakeBay

Phase 3 WIP Website:
www.dep.pa.gov/chesapeakebay/phase3

Sign Up for Participation in Countywide Action Plan