84% of Surface freshwater in North America

1/5 of the Surface freshwater in the world.
- 77 miles of coastline.
- 2% of the total Great Lakes watershed area.
The Great Lakes Water Quality Agreement (GLWQA) is a commitment between the United States and Canada to restore and protect the waters of the Great Lakes. The Agreement provides a framework for identifying binational priorities and implementing actions that improve water quality. It enhances water quality programs that ensure the “chemical, physical, and biological integrity” of the Great Lakes. EPA coordinates U.S. activities that fulfill the Agreement. States participate in Lake Partnerships, Annex Subcommittees, and Work Groups.
Great Lakes Water Quality Agreement Update

• **Annex 2: Lakewide Management**
  - 2013 Lake Erie Planning Year, 2014 Field Year (CSMI), 2015 Lab Analysis, 2016 Data Analysis, 2017 - Lake Erie Report and Outreach, 2018 - Creation of Lake Erie LAMP.
  - The Lake Erie LAMP will:
    - Establish Lakewide Ecosystem Objectives (LEOs)
    - Provide a “State of the Lake”
    - Identify science priorities.
    - Prioritize protection and restoration actions.
    - Integrate nutrient issues from Annex 4.
  - The Lake Erie LAMP Partnership Work Group will be assisting in the writing of the LAMP.
  - Nearshore Framework was finalized in late September.
Annex 2: General Objectives

1. Safe, high-quality drinking water.
2. Allow for unrestricted swimming and other recreation.
3. Allow for unrestricted consumption of fish and wildlife.
4. Free from pollutants that could be harmful to human health, wildlife, or aquatic organisms.
5. Healthy and productive wetlands and other habitats.
6. Free from nutrients in amounts that interfere with aquatic ecosystem health or human use.
7. Free from invasives that adversely impact water quality.
8. Free from harmful impact of contaminated groundwater.
9. Free from substances, materials or conditions that may negatively impact chemical, physical or biological integrity.
Annex 2: What are Lake Ecosystem Objectives?

- Benchmarks to assess status and trends in WQ and ecosystem health
- Support achievement of the General Objectives
- Established for each Great Lake and its connecting river system
- Binational
- Specify desired ecological condition
- Narrative or numeric
Great Lakes Water Quality Agreement Update

- **Annex 2: Lake Erie LEOs (draft)**

#1 ... be a source of safe, high-quality drinking water.
- Levels of pathogens, chemical contaminants, algal toxins and other substances in source water do not trigger drinking water advisories or drinking water plant closures.

#2 ... allow for swimming and other recreational use (unrestricted).
- Improve water quality so that the percentage of monitored beaches that are open and safe for swimming increases for U.S. and Canadian beaches (indicator).
Annex 2: Lake Erie LEOs (draft)

#3 ... allow for human consumption of fish and wildlife (unrestricted).
- Concentrations of contaminants responsible for fish consumption advisories (PCBs, mercury, and dioxin) measured in edible portions of Lake Erie fish continue to decline (indicator)

#4 ... be free from pollutants that could be harmful to human health, wildlife, or aquatic organisms.
- Contaminants in water continue to decline (indicator)
- Contaminants in gull eggs continue to decline (indicator)
- Contaminants in whole fish (walleye, rainbow smelt and lake trout) continue to decline (indicator)
Annex 2: Lake Erie LEOs (draft)

#5 ... support healthy and productive wetlands and other habitats to sustain resilient populations of native species.
- Functional coastal wetland extent increases and wetland condition improves (indicator)
- Increase in tributary connectivity (indicator)
- Increase in proportion of shoreline in a natural state (indicator)

#6 ... be free from nutrients that enter the water as a result of human activity, in amounts that promote growth of algae and cyanobacteria that interfere with aquatic ecosystem health, or human use.
- [5 LEOs specified in GLWQA 2012]
#7 ... be free from the introduction and spread of aquatic and terrestrial invasive species.

- No establishment of new aquatic invasive species (indicator)
- Sea lamprey population sizes and wounding rates below targets (indicator)

#8 ... be free from the harmful impact of contaminated groundwater.

- No LEO proposed at this time (General Objective is currently met)
• **Annex 2: Lake Erie LEOs (draft)**

  #9 ... be free from other substances, materials or conditions that may negatively impact the chemical, physical or biological integrity of the Waters of the Great Lakes.

  - No LEO proposed at this time (General Objective is currently met)

  ◦ Lake Erie Draft LEOs and a 50 page supporting appendix will be available soon on [www.binational.net](http://www.binational.net) for public comment and feedback.
Great Lakes Water Quality Agreement Update

• **Annex 4: Nutrients**
  ◦ Adopted new phosphorus reduction targets in February 2016.
  ◦ Developing a Binational Phosphorus Reduction Strategy 2018
  ◦ US and Canada each developing a Domestic Action Plan 2018
    • States developing individual DAPs by December 2017 for integration.
    • Canada/Ontario DAP draft available for comment on www.binational.net
  ◦ Great Lakes Commission developing ErieSTAT tracking.
Governs water use and diversions within the Great Lakes Basin. Designed to protect resource and reduce conflict between political jurisdictions.

Compact is signed between the states, ratified by Congress, implemented by states.

Agreement is between states AND provinces. Has same language as the compact.

Both were formalized in 2008.
• Created Water Resources Council (Compact Council) and the Regional Body.
• Pennsylvania maintains two alternates and designees of Governor Wolf.
• Each state must implement a water resources inventory, registration and reporting program.
• Each state must implement a water conservation and efficiency program.
Great Lakes and St. Lawrence River Basin Water Resources Compact and Agreement

- All new or increased withdrawals must meet criteria.
- BAN on all new or increased diversions from the basin (with 3 specific exceptions).
- Established **Regional Review** process for evaluating withdrawals and diversion exceptions.
Waukesha, WI Diversion Proposal

- Contaminated water supply. Chlorides/Radium
- Located outside of basin by approx. 1.5 miles but within groundwater boundary of influence.
- Applied for 10.1 MGD diversion of Great Lakes water from Lake Michigan.
- Approved for 8.2 MGD with conditions on June 21, 2016.
- www.waukeshadiversion.org
Great Lakes Cities Initiative has requested a hearing before the Compact Council regarding decision.

Hearing was conducted in Chicago, Il on March 20.

On April 20, the Compact Council ruled against the merits of the GLCI arguments, exhausting the administrative remedies.
Great Lakes Restoration Initiative – 2017 PA Cooperative Partnerships

- **PA Sea Grant**
  - Pennsylvania LEEF

- **Regional Science Consortium**
  - Harmful Algae Bloom Monitoring and Detection Program

- **Erie County Conservation District**
  - Implementation of PA VinES Program

- **Erie County Department of Public Safety**
  - Purchase of Spill Response Trailers (5)

- **Erie County Department of Health**
  - Mapping and monitoring of Small Flow Treatment Facilities (SFTF) in Erie County, PA

- **Erie County Department of Planning**
  - MSAP – Municipal Stormwater Assistance Program
The Plan is a non-prescriptive, non-regulatory, non-binding policy and guidance document related to the water resources of the Commonwealth. Discusses how much water we have, how much we use, and how much we need. Plan is accomplished through 7 regional water resources committees. GL Committee will be staffed by Tim Bruno and Jake Moore. Activities will begin in 2017 with Plan revision in 2018. PARTICIPATION NEEDED: Animal Production, and Engineer, Hydrologist, Planner, Lawyer, or Economist
Thank you!

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Department of Environmental Protection  |  Interstate Waters Office
Tom Ridge Environmental Center
301 Peninsula Drive, Suite 4
Erie, PA 16505
Phone: 814.835.1477  |  Fax: 814.833.0266

www.depweb.state.pa.us
Pennsylvania Lake Erie Phosphorus Reduction Domestic Action Plan (DAP)

Lake Erie Environmental Forum 4/24/2017
Manages phosphorus concentrations and loadings.

Establishes Lake Ecosystem Objectives.

Establishes Substance Objectives for TP Concentrations and Loadings

Requires program evaluation and enhancement.
Minimize hypoxic zones.
Maintain algae below nuisance.
Maintain healthy algae species.
Maintain cyanobacteria at levels below which are a threat to humans or ecosystem.
Maintain oligotrophic/biomass/algal species in Superior, Michigan, Huron Ontario
Maintain mesotrophic conditions in West/Central Erie and oligotrophic conditions in East Erie.
Within 3 years for Lake Erie: 2016
- Review interim objectives and loading targets.
- Determine loading allocations by country.
- Develop concentrations for nearshore waters.
- Establish load reduction targets for priority tributary watersheds.
- **COMPLETED**

Within 5 years: 2018
- Develop Binational Strategy and Domestic Action Plans (US and CA)
1. West Basin Cyanobacteria: N/A
2. West & Central Basin Nearshore: N/A
3. To minimize the extent of hypoxic zones in the waters of the central basin of Lake Erie: 40 percent reduction in total phosphorus entering the western and central basins of Lake Erie—from the United States and from Canada—to achieve an annual load of 6,000 metric tons to the central basin.
Regional Objectives

- Regional reduction objectives established through load modeling conducted by Maccoux, et al.
- Maccoux estimates better for larger sources (tributaries and point sources) that had more data available.
- Valuable for determining and assigning big reductions that need to occur on the lakewide scale.
What makes Maccoux excellent for large scale reductions, hampers Pennsylvania estimations.

Lack of high-frequency sampling and monitoring in PA, lack of major sources.

Batch calculated watershed areas mix Central and Eastern Basin PA tributaries.

Differing interpretations of Central Basin boundary required DEP to determine to assess specific point.

PA had to use reference watersheds and available data to estimate loading.
Defining Central Basin

- Utilized USGS bathymetry and geomorphology, in addition to feedback from USEPA to determine Central Basin boundary.
- Long. 42.109938, Lat. -80.159606
- 375 mi², 8 named tributaries, 6 small direct discharge areas.
237 NPDES permitted discharges in Central Basin watershed.

- 2 Concentrated Animal Feeding Operations
- 5 MS4 Permits: 4 General, 1 Ind., 1 waived
- 7 POTWs: 5 Minor (>1 MGD), 2 Major (1<5)
- 33 Industrial: 27 Minor, 5 No Discharge
- **166+ Private Wastewater Discharges**
Pennsylvania Non-Point Sources

- Pennsylvania tribs Ashtabula Creek or Conneaut Creek are combined into Ashtabula-Conneaut Complex, others lumped into “Direct Discharge” when they were modeled.
- Ashtabula and Conneaut consist of 161 mi² in PA, EPA models indicated 347 mi² total modeled (OH & PA). PA prorated Complex loading would be approximately 46.6% of total.

**Table 1: Estimated Pennsylvania Annual TP Loading to the Ashtabula-Conneaut Complex (2008-2013)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Complex Total TP Loading (MTA)</th>
<th>Prorated PA Complex TP Loading (MTA)</th>
<th>PA Percent TP Reduction Over 2008 Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>69</td>
<td>32.0</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>26</td>
<td>12.1</td>
<td>62.20%</td>
</tr>
<tr>
<td>2010</td>
<td>24</td>
<td>11.1</td>
<td>65.30%</td>
</tr>
<tr>
<td>2011</td>
<td>40</td>
<td>18.6</td>
<td>41.80%</td>
</tr>
<tr>
<td>2012</td>
<td>52</td>
<td>24.1</td>
<td>24.70%</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
<td>6.0</td>
<td>81.30%</td>
</tr>
</tbody>
</table>

*Statistics and percent reductions derived from data presented by Maccoux.*
• Total Ashtabula-Conneaut Complex area is 347 mi², and PA basin area is approximately 378 mi² for all tributaries west of Presque Isle.

• Using the Ashtabula-Conneaut Complex as a surrogate/reference, it’s useful in estimating total PA phosphorus contribution from the entire PA Central Basin drainage.

• Assuming similar loading rates between the Complex and the PA Central Basin, the then PA’s annual loading average loading average for the years 2008-2013 is approximately 40.7 MTA, or 0.51% of the total HEC, WB, CB load during that time period. This indicates PA is currently operating at or below the 40% TP reduction over 2008 levels for every year except one during that time period.

Table 2: Estimated Pennsylvania Annual TP Loading to the Central Basin (2008-2013)

<table>
<thead>
<tr>
<th>Year</th>
<th>Complex Total TP Loading (MTA)</th>
<th>Estimated PA Central Basin TP Loading (MTA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>69</td>
<td>75.2</td>
</tr>
<tr>
<td>2009</td>
<td>26</td>
<td>28.3</td>
</tr>
<tr>
<td>2010</td>
<td>24</td>
<td>26.2</td>
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<tr>
<td>2011</td>
<td>40</td>
<td>43.6</td>
</tr>
<tr>
<td>2012</td>
<td>52</td>
<td>56.7</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
<td>14.2</td>
</tr>
</tbody>
</table>

2008-2013 Average Annual TP Loading: 37.3 MTA, or 40.7 MTA

Table 3: Estimated Pennsylvania Annual Percent TP Loading to the Central Basin (2008-2013)

<table>
<thead>
<tr>
<th>Year</th>
<th>Maccoux Central Basin TP Loading (MTA)</th>
<th>Estimated PA Central Basin TP Loading (MTA)</th>
<th>Estimated PA Central Basin % of Total Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>9736</td>
<td>75</td>
<td>0.77</td>
</tr>
<tr>
<td>2009</td>
<td>7637</td>
<td>28</td>
<td>0.37</td>
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<tr>
<td>2010</td>
<td>5352</td>
<td>26</td>
<td>0.49</td>
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<tr>
<td>2011</td>
<td>10092</td>
<td>44</td>
<td>0.43</td>
</tr>
<tr>
<td>2012</td>
<td>7045</td>
<td>57</td>
<td>0.80</td>
</tr>
<tr>
<td>2013</td>
<td>7403</td>
<td>14</td>
<td>0.19</td>
</tr>
</tbody>
</table>

2008-2013 Estimated Average PA Percentage of Total CB Loading: 0.51
**Conclusions:**

- PA’s phosphorus contributions to CB are de minimus and have little overall effect on the hypoxia/anoxia being observed in CB.

- Even if it was possible for PA to reduce tributary loading from current levels (which are low), it would likely provide reductions on the hypoxia issue by a small fraction of a percent.

- Pennsylvania’s loading contributions to the Central Basin of Lake Erie are likely already attaining the 40% reduction in TP over the 2008 baseline.

- Additionally, the loading estimations suggest that any additional large-scale phosphorus reductions in some Pennsylvania tributaries may affect the biologic productivity of the stream systems.
Provide Greater Assurance of Pennsylvania Phosphorus Loading Estimations

Pennsylvania will conduct the following activities by the year 2021 to attain greater confidence in the loading estimations:

- **Research and Assemble all Available Water Quality Data for Central Basin Tributaries**
  Pennsylvania will gather all available and applicable monitoring records for Central Basin tributaries from state, county, local and non-profit entities. Additionally, point source discharge permits and associated discharge monitoring records for permittees located in the Central Basin watersheds will be researched.

- **Evaluate and Assess Applicability of Existing Data and Report**
  Pennsylvania will evaluate the quantity and quality of the data sources, catalog by tributary, assess the applicability of the data for phosphorus reduction estimations, identify data gaps, and produce a report defining data needs.

- **Conduct Tributary Land Use Assessment and GIS-based Nutrient Modeling**
  Pennsylvania will use historical geospatial data to conduct a land use and land cover assessment of Central Basin tributary watersheds to determine trends that could indicate changes in nutrient contributions in those watersheds. The assessment outputs will be used in a GIS-based pollutant transport model appropriate for the size and scale of the tributaries.

During the years 2021 and 2022, Pennsylvania will evaluate the existing data, land use and land cover assessments, any available pollutant transport modeling, and then determine with the help of other agencies such as USGS and U.S. EPA additional data needs in specific tributaries necessary to increase the statistical confidence of the pollutant transport models.
Prioritize Delivery of Nutrient Reduction Programs to Central Basin Tributaries

- **PADEP Clean Water**
  - SWM Associated with Construction Activities
  - Small Flow Treatment Facilities
  - Concentrated Animal Feeding Operations
  - MS4 Permitting
  - Act 537 Sewage Facilities Planning Program
  - NPDES E&S Control Permitting
  - Manure and Nutrient Management
  - Agricultural Erosion and Sediment Management

- **PADEP Coastal Resource Management Program**
  - Coastal Zone Management Program
**DEP Partnerships with County/Local Governments and Non-Governmental Orgs**

- **PA Vested in Environmental Sustainability Program (VinES)**
  - Erie County Conservation District

- **Erie County Small Flow Treatment Facility Program**
  - Erie County Department of Health

- **Urban Stormwater Management and Green Infrastructure Initiatives**
  - Multiple Partners
Measuring Progress and Achieving Consensus

• PADEP will be responsible for compiling and evaluating NPDES discharge monitoring reports for facilities in the Pennsylvania Central Basin tributaries for average monthly phosphorus discharge concentrations and total discharge volumes.

• PADEP will produce a report quantifying known phosphorus contributions and reductions on a frequency to be mutually determined between PADEP and U.S. EPA.

• PADEP will participate in the submission of phosphorus contribution and reduction data to U.S. EPA or a designated third-party entity on a frequency to be mutually determined for the purposes of tracking and accounting for total lakewide phosphorus reductions.
Public Participation and Adaptive Management


- Draft US Domestic Action Plan by December and finalize by February 2018

- Lake Erie’s basins are dynamic, natural systems that require adequate time to assess how the system is responding to inputs. *Adaptive Management*

- Update plan every 5 years based on lake response and local success.
PA Domestic Action Plan

Thank you!