E3 Model Scenario
Purpose and Definitions

Gary Shenk (USGS)
Jeff Sweeney (EPA)
Chesapeake Bay Program Office

Water Quality GIT Meeting
August 14, 2017

Chesapeake Bay TMDL

- Section 6. Establishing The Allocations For The Basin-Jurisdictions
- The E3 scenario—everything by everyone everywhere—represents a best-case possible situation, where a certain set of possible BMPs and available control technologies are applied to land, given the human and animal populations, and wastewater treatment facilities are represented at highest technologically achievable levels of treatment regardless of costs.

Phase 6 E3 Model Scenario
Definition

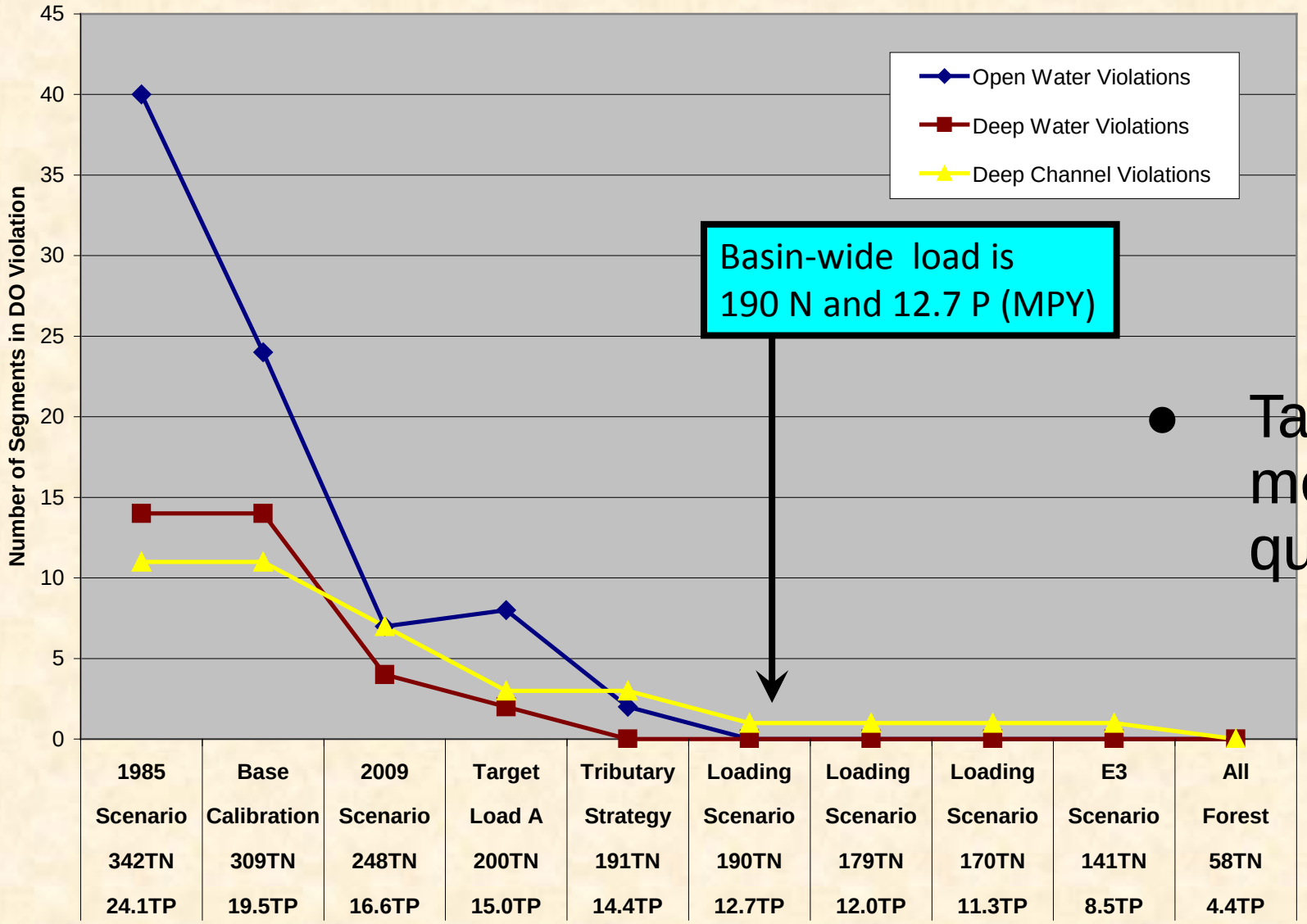
- Appendix J
- The E3 Scenario is an estimate of the application of management actions ... with the theoretical maximum practicable levels of managed controls on all pollutant load sources. There are no cost and few physical limitations to implementing BMPs for point and nonpoint sources in the E3 scenario.
- Generally, E3 implementation levels and their associated reductions in nutrients and sediment could not be achieved for many practices, programs and control technologies when considering physical limitations and participation levels.

Phase 6 E3 Model Scenario

Definition

- It is used with the No-Action scenario to define “controllable” loads, the difference between No-Action and E3 loads.
- This calculation of controllable loads addresses all three rules for determining Planning Targets:
  - Targets must meet water quality standards
  - Those that pollute more should do more.
  - Actions already taken count toward the goals.

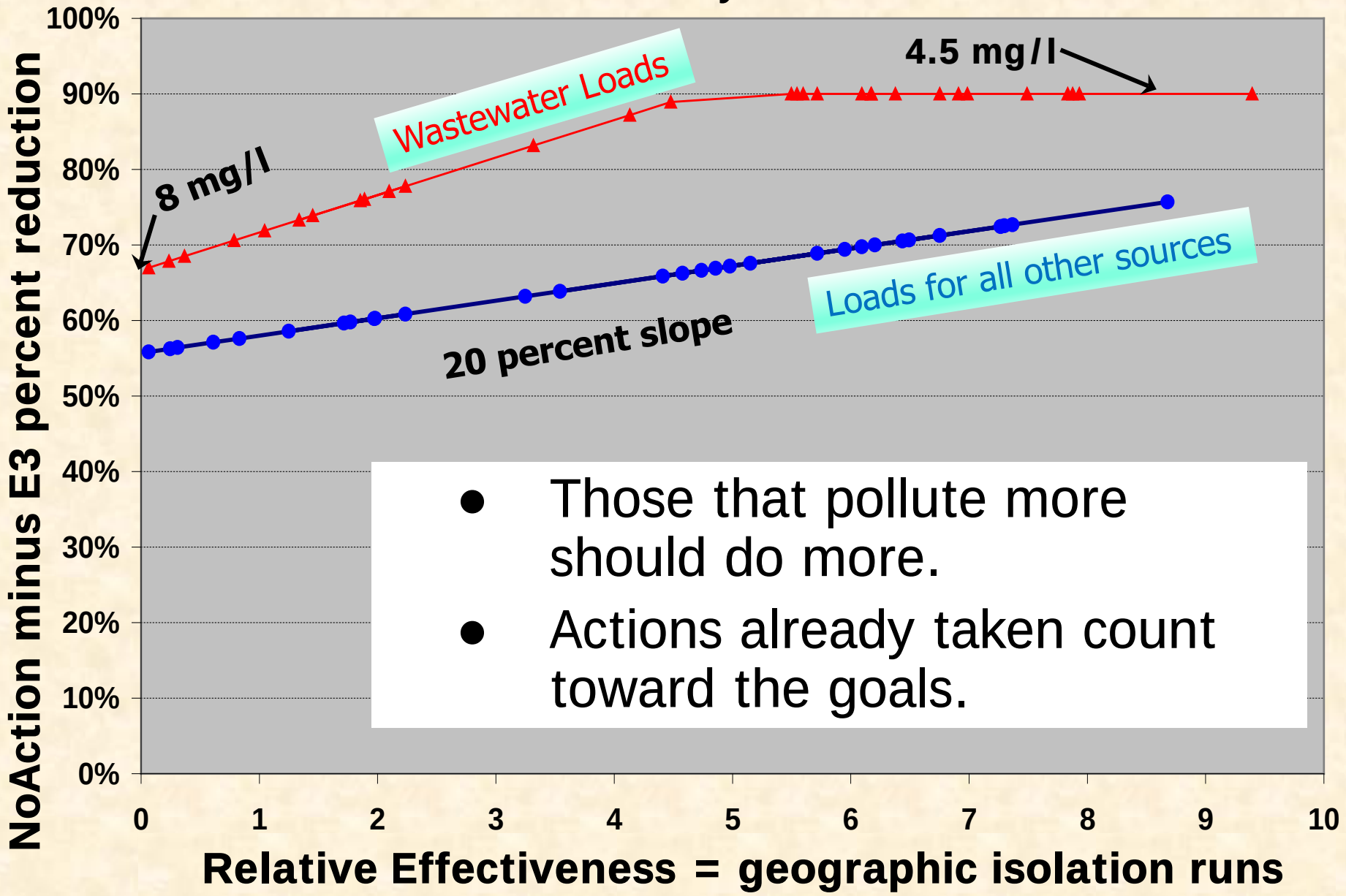
Dissolved Oxygen Criteria Attainment



- Targets must meet water quality standards

Phase 5 Planning Target Methodology

"Hockey Stick"

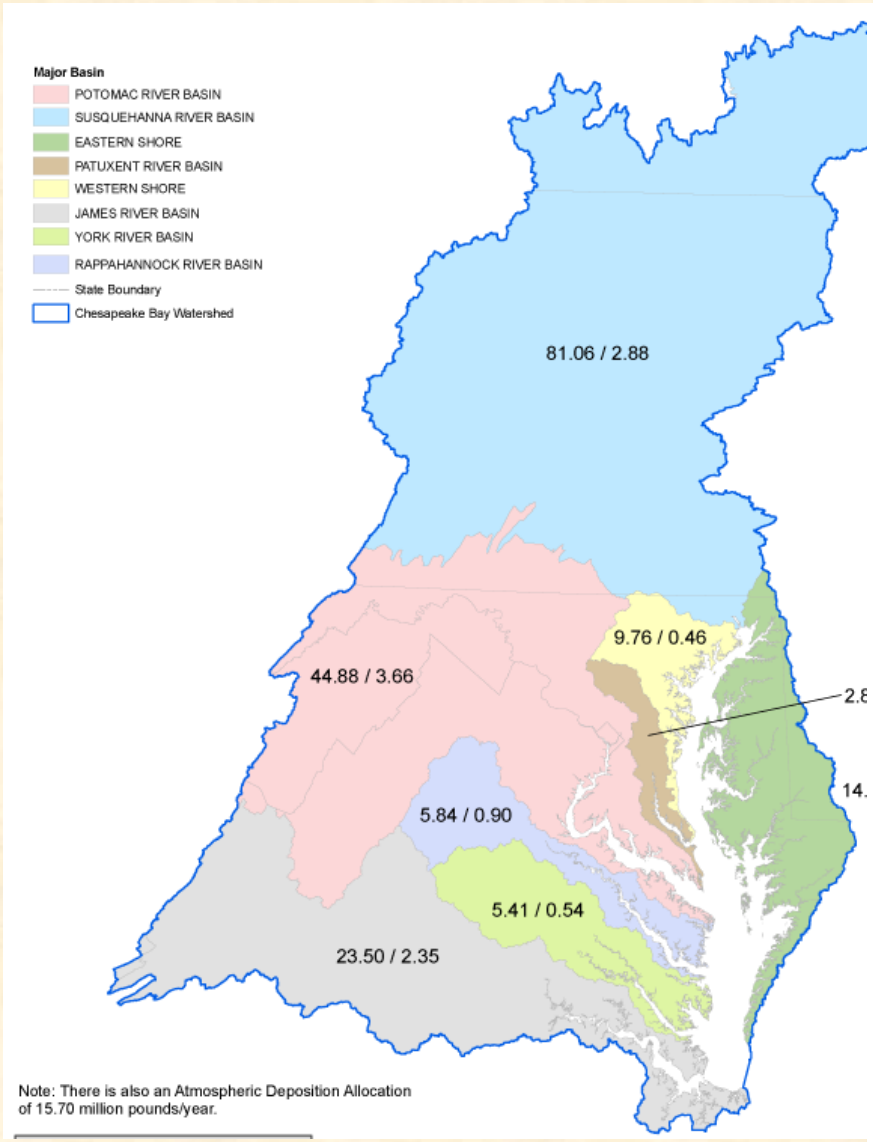


- Those that pollute more should do more.
- Actions already taken count toward the goals.

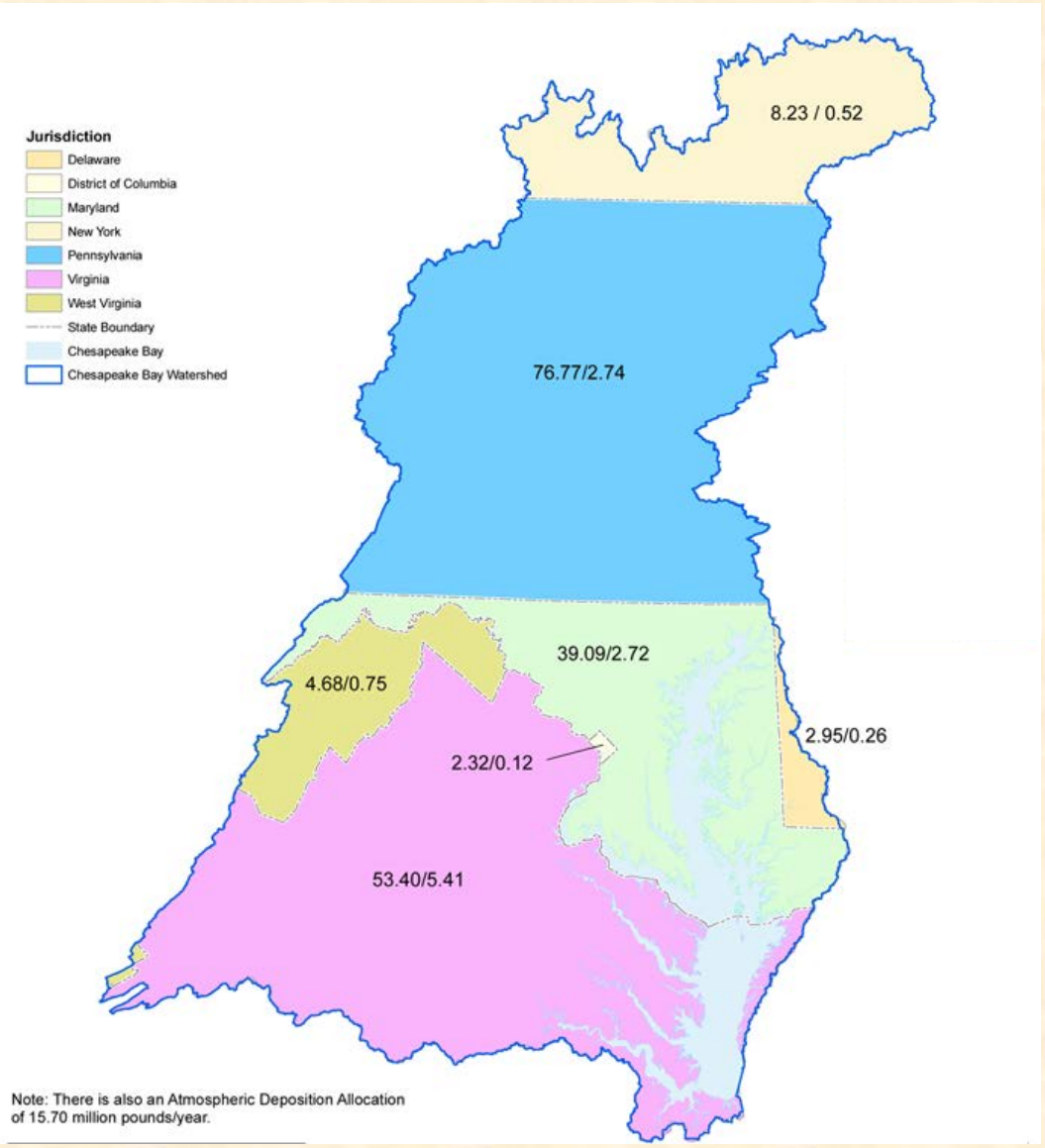
Phase 6 E3 Model Scenario Definition

- Differences among regions occur because of more "uncontrollable" differences in, for example:
  - animal and human populations,
  - number and types of wastewater facilities,
  - agricultural land types and areas,
  - urban land areas,
  - atmospheric deposition,
  - Watershed characteristics

Pollution Diet by River



Pollution Diet by State



Points to Consider

- Planning targets are for all sources in an area. They do not determine the amount needed from each sector
  - Moving the WWTP line up or down means that more or less is expected from **state-basins** with high loading from WWTPs
- Choice of WWTP line is set. Choice of E3 does not affect the total necessary reduction from NPS to establish planning targets
- Choice of E3 affects the planning targets of state-basins that are dominated by ag or urban
  - Choice of E3 does not determine reductions necessary from ag or urban. These are set through WIP process

Phase 6 E3 Model Scenario

WQGIT Decision 10/25/16:

- The WQGIT agreed to recommend to the Management Board that the Partnership apply the same methodological approach to establishing the Phase III WIP planning targets as was used by the partners in the development of the jurisdictions' major river basin allocations under the 2010 Chesapeake Bay TMDL,
- recognizing the need to update the No Action and E3 scenarios as well as estimates of relative effectiveness to reflect the Partnership's suite of Phase 6 models and greatly expanded list of Partnership-approved BMPs.

Phase 6 E3 Model Scenario

Tutorials on E3 and Planning Targets

Water Quality GIT

- Dec 15, 2015
- June 27, 2016
- Oct 24, 2016
- Nov 14, 2016
- Jan 9, 2017
- Jan 23, 2017
- June 26, 2017
- July 24, 2017

Agriculture WG

- Sep 15, 2016
- Oct 5, 2016
- April 20, 2017
- June 29, 2017
- July 20, 2017

Urban Stormwater WG

- May 17, 2016
- June 21, 2016
- July 26, 2016
- Sept 20, 2016
- Oct 6, 2016
- Nov 15, 2016
- June 27, 2017

Waste Water Technical WG

- Aug 2, 2016
- Sep 13, 2016
- Oct 4, 2016

Forestry WG

- Nov 2, 2016
- May 3, 2017

Phase 6 E3 Model Scenario

WQGIT Decision 10/25/16:

- The WQGIT agreed to proceed forward with an updated Phase 6 version of the Partnership's E3 scenario based on the following:
  - Additional work is needed to characterize the "E3" scenario. The TMDL includes multiple contradictory characterizations of the scenario.
  - Approval of application of the more rigorous, originally-proposed stormwater E3 scenario components developed by the USWG's Chair and Coordinator;
  - Approval of application of the proposed updated agriculture E3 scenario components previously approved by the AgWG with the recognition that:
    - Further updates may be made based on approval by the AgWG as new information is available on manure transport BMPs and the Phase 6 land cover and land use data; and
    - The AgWG will work with the Forestry WG to enhance the domain of acres eligible for forestry BMPs;

Phase 6 E3 Model Scenario

WQGIT Decision 10/25/16:

- The WQGIT agreed to proceed forward with an updated Phase 6 version of the Partnership's E3 scenario based on the following:
  - Approval of application of the proposed updated wastewater treatment E3 scenario components previously approved by the Wastewater Treatment Workgroup and presented to the WQGIT;
  - Agreement on the need to add missing E3 scenario components for shoreline management and in-situ BMPs (i.e. algal flow way technologies, oyster aquaculture).

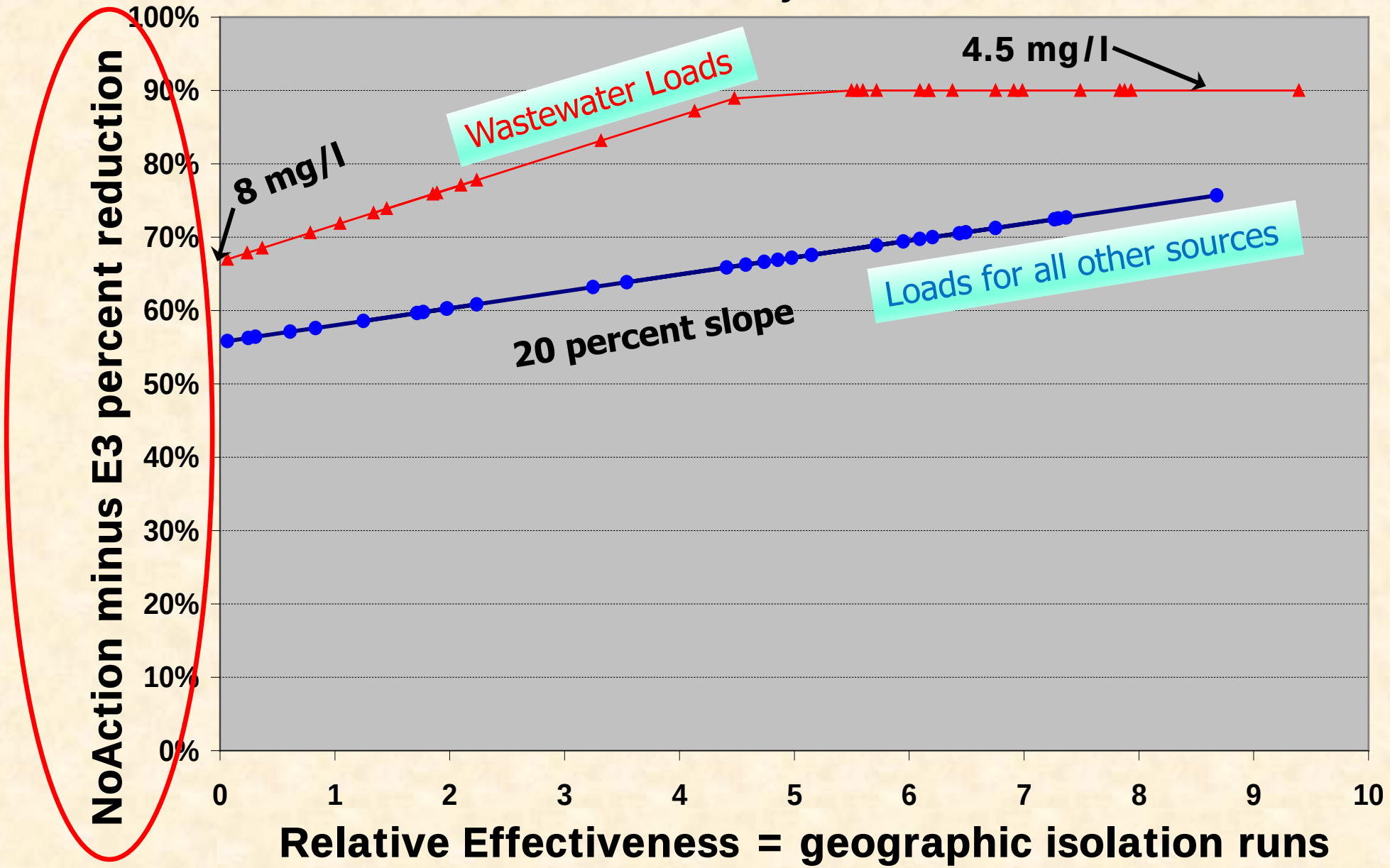
Phase 6 E3 Model Scenario

Wastewater Treatment Workgroup (WWTWG), 12/20/16:

- At their November 28th meeting, the WQGIT agreed to the wastewater treatment decision rules for the Phase III WIP planning target methodology.
- In order to define the two wastewater treatment “hockey stick” lines, total nitrogen concentrations will remain at 4.5 mg/L and 8 mg/L and the total phosphorus concentrations at 0.22 mg/L and 0.54 mg/L.
- These are the same concentrations used during the development of the Chesapeake Bay TMDL in 2010.

Phase 5 Planning Target Methodology

"Hockey Stick"



Phase 6 E3 Scenario

Agriculture & Forestry BMPs

Agriculture & Forestry	Bold italics indicates changes since Oct, 2016 version
Phase 6 BMP	**E3 Implementation Level**
Nutrient Management Core N, Nutrient Management Core P	100% of all available agricultural landuses
NM Supplemental: N and P Placement, N and P Rate, N and P Timing	100% of all available agricultural landuses
Tillage Management-High Residue/Minimal Soil Disturbance	100% of row crops (excluding corn silage and soybeans), and low input specialty crops
Tillage Management-Conservation Tillage	100% of select row crops including corn silage and soybeans, and high input specialty crops; excludes mushrooms, greenhouse and container nursery
Tillage Management-Low Residue Tilage	100% of select high input specialty crops including potatoes, peanuts, tobacco; excludes mushrooms, greenhouse and container nursery
Cover Crop	81% of row crops; not associated with small-grain production and high input specialty (excludes mushroom, greenhouse and container nursery; early, drilled, rye
Commodity Cover Crop	19% of row crops; associated with small-grain production; early, drilled, wheat
Cover Crop Composite	100% of row crops and high input specialty crops; excludes mushroom, greenhouse, and container nursery
Off Stream Watering Without Fencing	100% of all available livestock pasture
Prescribed Grazing	100%; includes PIRG acres
Forest Buffer-Streamside with Exclusion Fencing	*Pasture land within 30m of all streams and rivers that's unbuffered - from high-resolution land cover (originally 5% of pasture for Phase6, 10% for Phase5)*
Pasture Management Composite	100%
Forest Buffers	*Crop land within 30m of all streams and rivers that's unbuffered - from high-resolution land cover (originally 6% of cropland for Phase6, 15% for Phase5)*
Wetland Restoration	1% of available crops and pasture
Land Retirement to Ag Open Space and to Pasture	7% of available crops and pasture
Tree Planting	*1% of available crops and pasture*
	Total land use change not to exceed 15%

Phase 6 E3 Scenario

Agriculture & Forestry BMPs

Phase 6 BMP	E3 Implementation Level
Alternative Crops	1% of row crop
Soil Conservation and Water Quality Plans	100% over all available agricultural land uses
Manure Injection	Will be added based on applicable land use and manure type availability (0% Row with Manure)
Manure Incorporation; Low Disturbance	Will be added based on applicable land use and manure type availability (100% Row with Manure)
Manure Transport	*Will be added based on excess of crop goal; Includes benefits of Manure Treatment Technologies*
Crop Irrigation Management	*Will be added if approved*
Livestock Waste Management Systems	100% of all livestock production areas
Poultry Waste Management Systems	100% of all poultry production areas
Animal Waste Management Systems	100%
Livestock Mortality Composting	100% of all livestock mortality
Poultry Mortality Composting	100% of all poultry mortality
Mortality Composting	100%
Barnyard Runoff Control	100% of all large animal livestock facilities
Loafing Lot Management	100% of all large animal livestock facilities
Animal Feed Operations	100%
Dairy Precision Feeding and/or Forage Management N	100% of Dairy @ TN = 24% reduction
Dairy Precision Feeding and/or Forage Management P	100% of Dairy @ TP = 28% reduction
Biofilters and Lagoon Covers	100% of Dairy and Swine, excludes manure storage for dry manure/stackable manure
Non-Urban Stream Restoration	*15% of agriculture stream miles are restored @ twice the default Stream Restoration value.*
	Stream miles from Chesapeake Conservancy synthetic data layer at lower order than National Hydrography Dataset (NHD).
Shoreline Erosion Control	*Any practice along agriculturally-dominated tidal shorelines that prevents and/or reduces tidal sediments to the Bay.*
	Shoreline practices can include living shorelines, revetments and/or breakwater systems and bulkheads and seawalls.
	Using new buffer data set of buffered:unbuffered shoreline to define domain.

Phase 6 E3 Scenario

Urban, Forestry & Septic

Urban, Forestry & Septic	Bold italics indicates changes since Oct, 2016 version
Phase 6 BMP	**E3 Implementation Level**
Stormwater Management - New Development	100% of new development has Runoff Reduction BMPs sized for 2.0 inch Impervious area
Stormwater Management - Retrofits	Runoff Reduction Retrofits sized to treat 1.5 inch Impervious area for 75% of each urban land use type (accommodates physical limitations)
Stormwater Management Composite	100% of area that can be managed
Erosion & Sediment Control	100% of construction sites are treated to ESC Level 3 and have high-risk Urban Nutrient Management plans
Urban Nutrient Management	100% eligible Pervious Cover has Urban Nutrient Management Plan implementation which is split 20% High Risk and 80% Low Risk
Forest Buffers	*All turfgrass (no canopy) within 30m of all streams and rivers that's unbuffered - from high-resolution land cover*
Urban Tree Canopy	*10% gain (2,400 additional acres) of canopy from now (2013) by 2025*
Street Cleaning	100% of Transport Impervious Cover swept using SCP-1
Advanced Grey Infrastructure Nutrient Discovery Program & Storm Drain Clean Outs	5% of Urban N and P load removed due to both credits
Urban Stream Restoration	*15% of urban stream miles are restored @ twice the default Stream Restoration value.* *Stream miles from Chesapeake Conservancy synthetic data layer at lower order than National Hydrography Dataset (NHD).*
Shoreline Erosion Control	*Any practice along urban-dominated tidal shorelines that prevents and/or reduces tidal sediments to the Bay.* *Shoreline practices can include living shorelines, revetments and/or breakwater systems and bulkheads and seawalls.* *Using new buffer data set of buffered:unbuffered shoreline to define domain.*
Septic Connections	10% of septic systems connected to wastewater treatment facilities
Septic Denitrification Enhanced	100% of systems remaining after connections
Resource BMPs	**Bold italics indicates changes since Oct, 2016 version**
Forest Harvesting BMP	100% of Harvested Forest area
Forest Conservation	*No net loss of true forest*
DiploidOysters3	*MD = 112 M oysters; VA = 280 M oysters*

Phase 6 E3 Model Scenario

For final versions of Phase 6 scenarios and development of Planning Targets, we need:

- Decision on what year to use for No-Action and E3 scenarios – after assessing options
  - Initial scenarios are 2010 background conditions
- Workgroups can review model results of No-Action, E3, Phase II WIPs with Phase 6 model, etc.
- Geographic isolation runs
- Approved model – after fatal flaw review by partnership; September, 2017