

Key Scenarios of the 2017 Midpoint Assessment

Water Quality Goal Implementation Team

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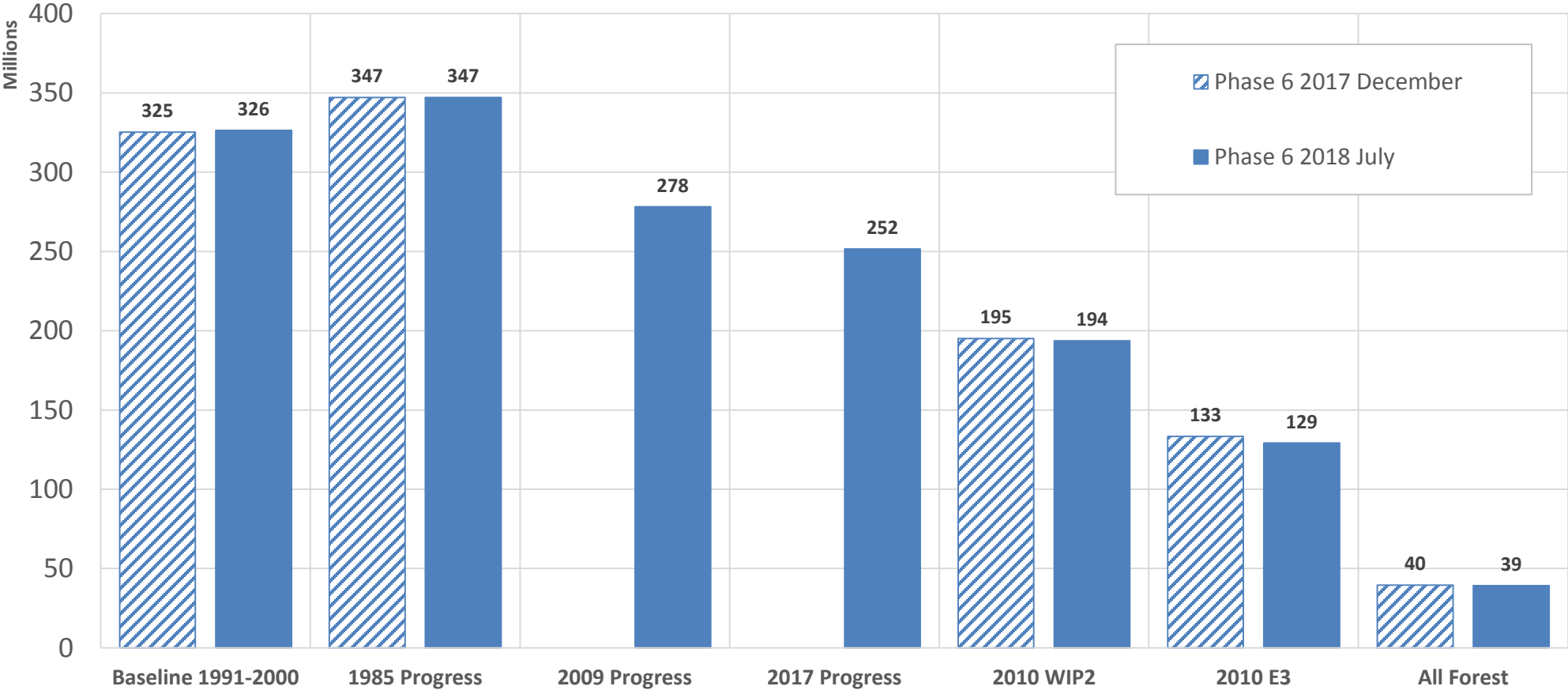
Chesapeake Bay Program
Science, Restoration, Partnership

Key Scenario Loads

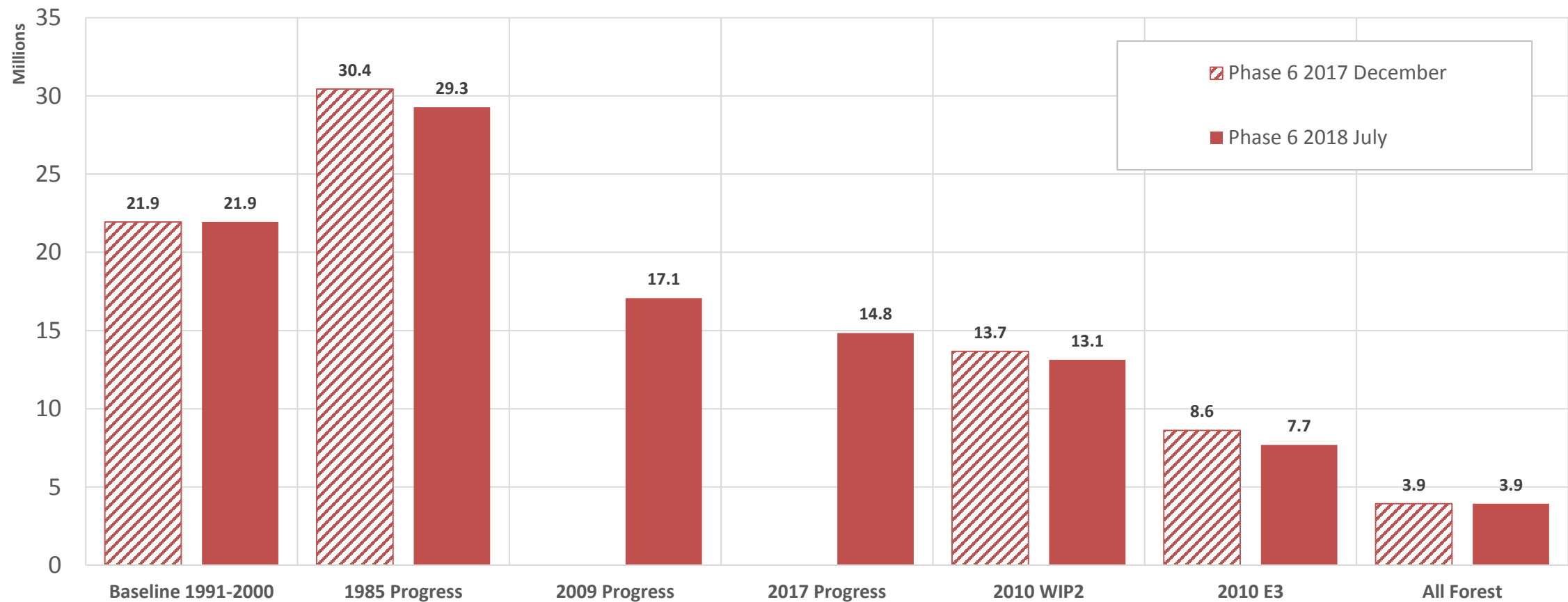


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Total Nitrogen Delivery to the Bay (in million pounds)



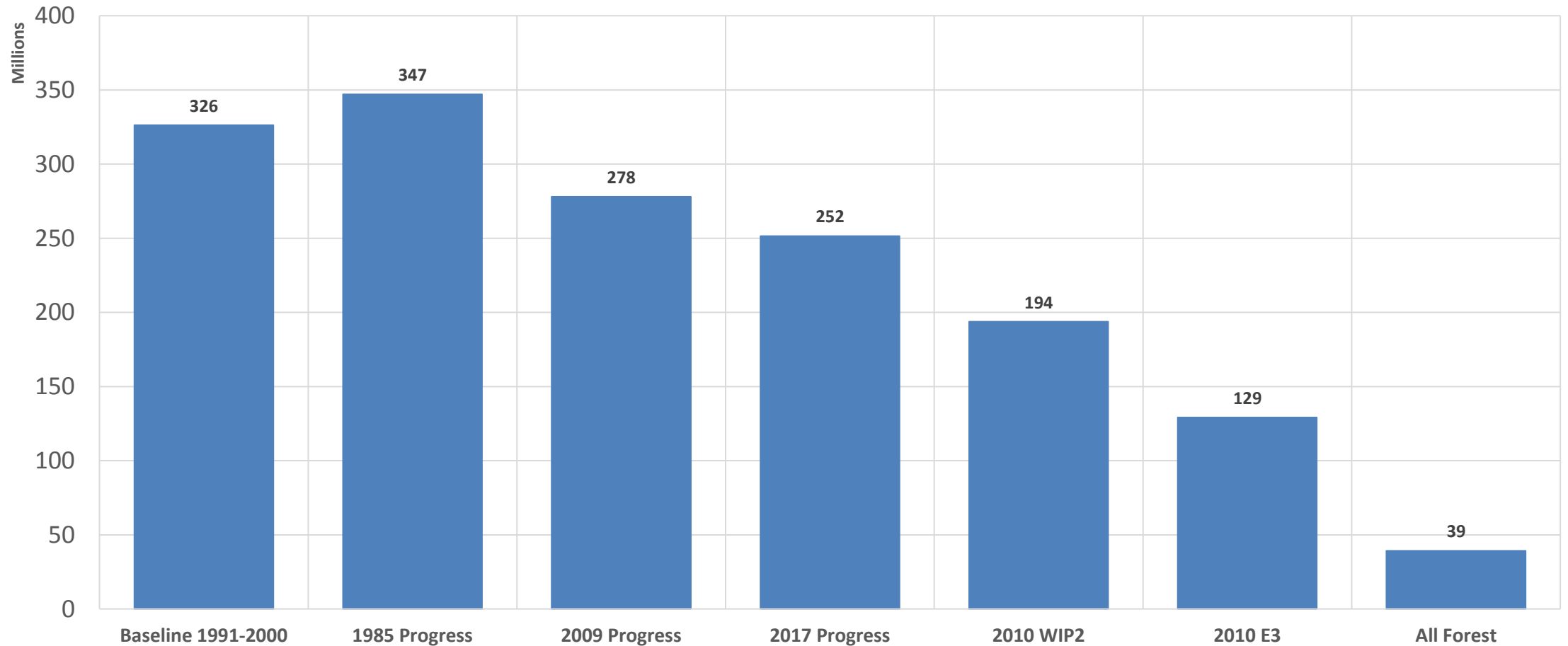
Total Phosphorus Delivery to the Bay (in million pounds)



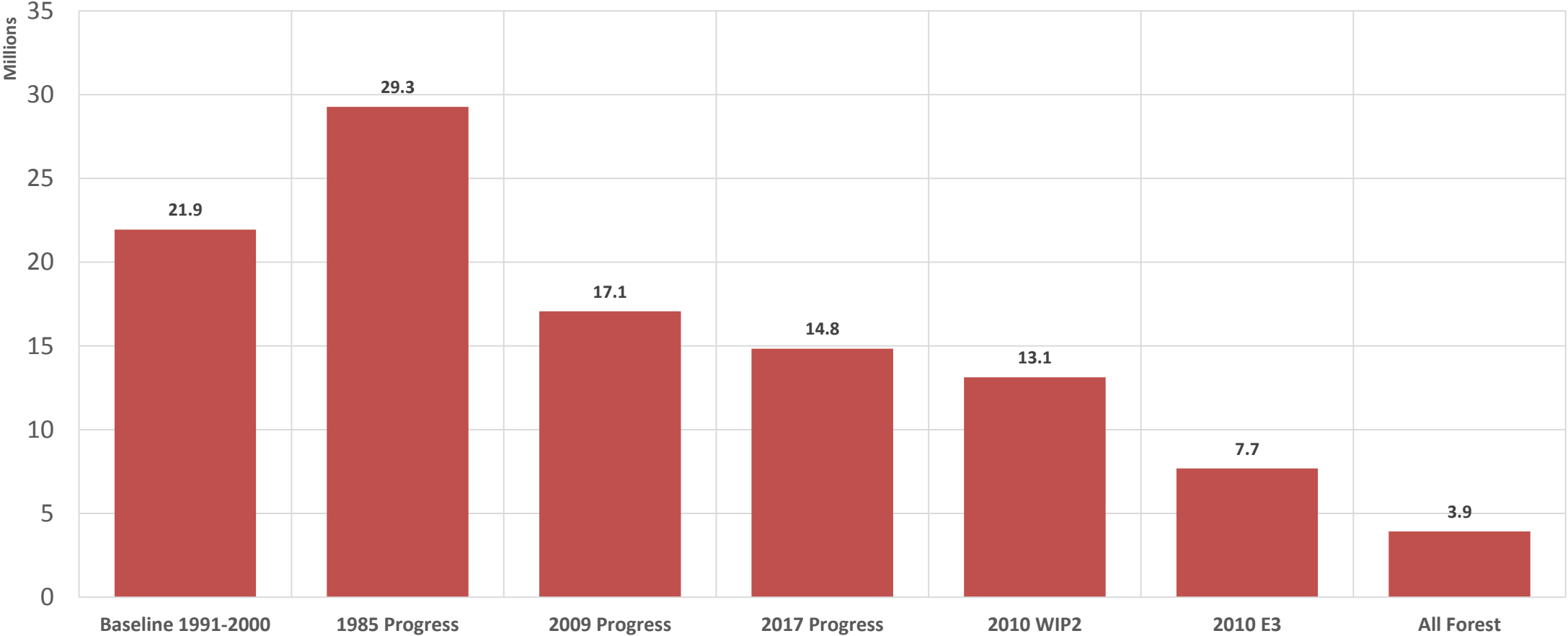
Total Suspended Solids Delivery to the Bay (in billion pounds)



Total Nitrogen Delivery to the Bay (in million pounds)



Total Phosphorus Delivery to the Bay (in million pounds)



Total Suspended Solids Delivery to the Bay (in billion pounds)

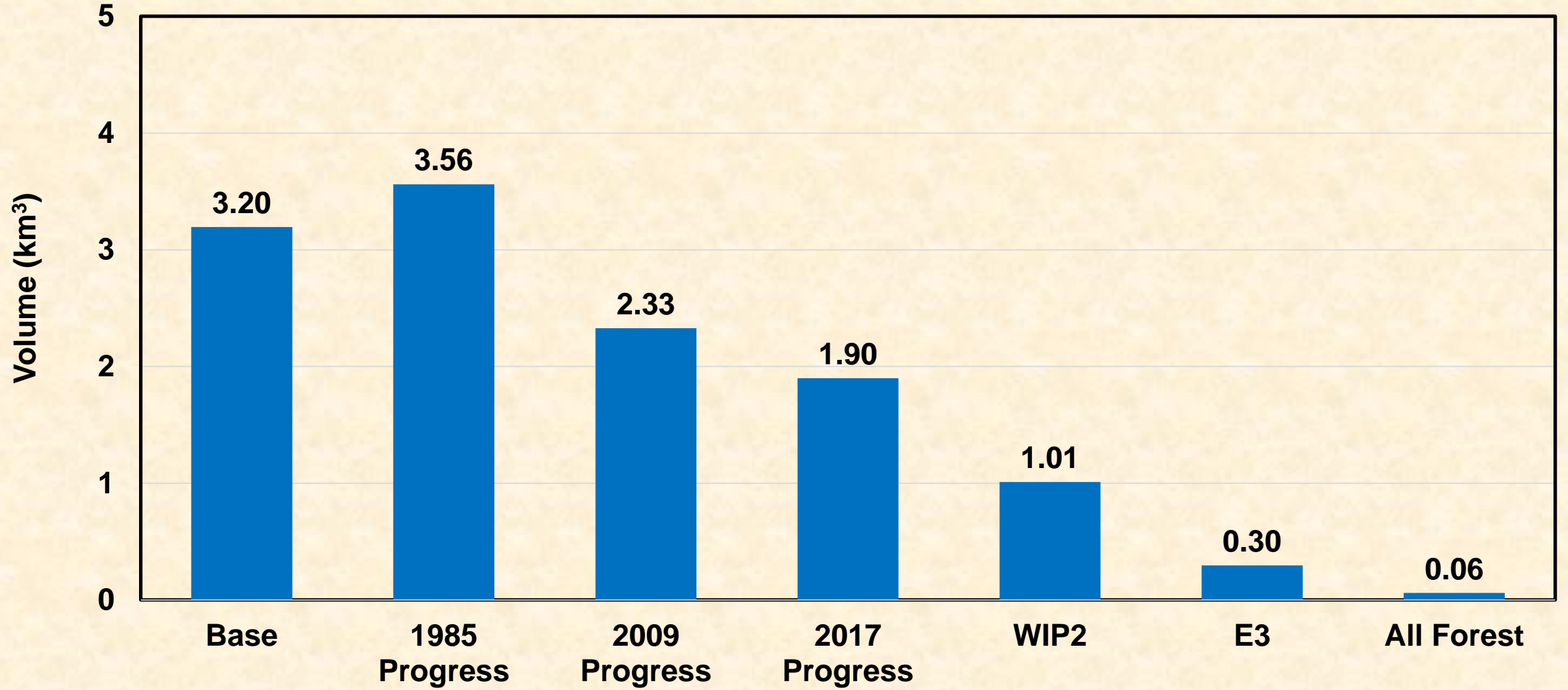


Key Scenario Tidal Water Quality Response



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Average Hypoxia Volume (DO<1 mg/l) summer 1991-2000 Whole Bay



Deep Channel DO Nonattainment

Final P6 12/10/18	1985		2009		2017			
	Base	Progress	Progress	Progress	WIP2 LOE	E3	All Forest	
	326TN	347TN	278TN	252TN	194TN	129TN	39TN	
	21.9TP	29.3TP	17.1TP	14.8TP	13.1TP	7.7TP	3.9TP	
	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
CB Seg & State	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel
CB3MH MD	7.0%	9.1%	1.8%	0.5%	0.0%	0.0%	0.0%	0.0%
CB4MH MD	44.8%	47.8%	32.6%	24.9%	5.3%	0.0%	0.0%	0.0%
CB5MH MD	20.7%	22.8%	10.1%	3.5%	0.0%	0.0%	0.0%	0.0%
CB5MH VA	4.0%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
POTMH MD	15.5%	17.8%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%
RPPMH VA	13.3%	19.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PATMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CHSMH MD	11.2%	15.4%	7.3%	3.2%	0.0%	0.0%	0.0%	0.0%
EASMH MD	18.0%	20.8%	14.1%	12.7%	6.0%	0.0%	0.0%	0.0%

Deep Water DO Nonattainment

Final P6 12/10/18	1985		2009		2017		WIP2 LOE		E3	All Forest
	Base	Progress	Progress	Progress	Progress	Progress	Progress	Progress	Progress	Progress
	326TN	347TN	278TN	252TN	194TN	129TN	39TN			
	21.9TP	29.3TP	17.1TP	14.8TP	13.1TP	7.7TP	3.9TP			
CB Seg & State	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
	Deep Water	Deep Water	Deep Water	Deep Water	Deep Water	Deep Water	Deep Water	Deep Water	Deep Water	Deep Water
CB3MH	1.3%	1.7%	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CB4MH	18.7%	21.0%	11.4%	8.9%	4.9%	0.7%	0.0%	0.0%	0.0%	0.0%
CB5MH MD	6.1%	6.9%	3.7%	2.8%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
CB5MH VA	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CB6PH	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CB7PH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PATMH	14.8%	20.7%	4.4%	1.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
MAGMH	14.5%	22.3%	2.1%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SOUMH	7.5%	8.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SEVMH	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PAXMH	7.4%	11.6%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
POTMH MD	3.7%	4.3%	1.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RPPMH	5.3%	6.7%	2.4%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YRKPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CHSMH	0.1%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EASMH	0.89%	3.57%	0.44%	0.60%	0.45%	0.41%	0.00%	0.00%	0.00%	0.00%

Key Scenario Methods

Key scenarios ranged from high loads to low loads and were the 1) 1985 Progress Scenario, 2) 2009 Progress Scenario, 3) 2017 Progress Scenario, 4) the WIP II Level of Effort (LOE) Scenario, 5) the E3 Scenario, meaning Everything, Everywhere, by Everyone, or the maximum level of effort scenario., and 6 the All Forest Scenario. The key scenarios illustrate features of model behavior under high and low loadings. The highest estimated historical loads are from 1985, which is prior to widespread nutrient and sediment reduction practices in the Chesapeake watershed. Before 1985, the nutrient loads are estimated to have steadily increased, particularly with the widespread use of fertilizers and hydrocarbon fuels since the mid-1940s. After 1985, the reductions by state and federal actions began to reduce nutrient loads in the Chesapeake watershed from the 1985 zenith. The lowest estimated loads are represented by the E3 and All Forest scenarios

1985 Progress - High Historical Load Scenario

This scenario uses the estimated 1985 land uses, animal numbers, atmospheric deposition, and the point source loads on the partnership's 1991-2000 ten year average hydrology. The scenario's nutrient and sediment loads are the highest historical load estimates (using a constant 1991–2000 hydrology).

2009 Progress Scenario

This scenario uses the estimated 2009 land uses, animal numbers, atmospheric deposition, and point source loads on the partnership's 1991-2000 ten year average hydrology. The 2009 year was chosen for simulation as it was part of a progression to show historical progress in nutrient and sediment reductions in the Chesapeake Bay watershed in the year just prior to carrying out of the historical 2010 TMDL of the Chesapeake Bay

2017 Progress Scenario

This scenario uses the estimated 2017 land uses, animal numbers, atmospheric deposition, and point source loads on the partnership's 1991-2000 ten year average hydrology. The 2017 year was chosen for simulation because it is the year of the 2017 Midpoint Assessment of the Chesapeake TMDL progress. In addition, the 2017 year has the most recent year estimates of input information available.

WIP2 LOE Scenario

This scenario uses the estimated 2010 land uses, animal numbers, atmospheric deposition, and point source loads and applies all of the point and nonpoint source management actions taken in the Watershed Implementation Plan phase 2 (WIP2) throughout the Chesapeake watershed (Tables 1, 2, and 3). In many cases the exact nonpoint source management action represented in the previous Phase 5.3.2 Model representation of the WIP2 has to be approximated because of different land uses or management practices in the Phase 6 Model. Overall though, the WIP2 LOE Scenario is the best representation achievable of the management Level of Effort (LOE) in the Phase 2 WIPs.

E3 - Everyone, Everything, Everywhere Scenario

The E3 Scenario is an estimate of applying management actions to the fullest possible extent. The E3 scenario is a what-if scenario of watershed conditions with theoretical maximum levels of managed controls on load sources (Tables 1, 2, and 3). There are no cost and few physical limitations to implementing BMPs for point and nonpoint sources in E3. It is used with the No-Action scenario to define controllable loads, the difference between No-Action and E3 loads.

Controllable loads are a component of the methodology to allocate target loads needed to meet water quality standards to different regions of the Chesapeake Bay watershed. Load allocations of target caps also take into consideration the relative effects on water quality standards from load reductions in regions throughout the watershed. Differences between No-Action and E3 scenario loads provide equity among regions of the Chesapeake Bay watershed in that assumptions of point source controls and nonpoint source practice and program implementation levels for each scenario are spatially universal. Differences among regions occur because of more inherent differences in, for example, animal and human populations, the number and types of point source facilities, agricultural land types and areas, urban land areas, atmospheric deposition, and so on.

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. E3 includes most technologies, practices and programs that have been reported by jurisdictions as part of annual model assessments, Tributary Strategies, and Milestones.

For most nonpoint source BMPs, it was assumed that the load from every available acre of the relevant land area was being controlled by a suite of existing or innovative practices. In addition, management programs converted land uses from those with high yielding nutrient and sediment loads to those with lower. E3 does not include the entire suite of practices because of the goal of achieving maximum load reductions. The BMPs that are fully implemented have been estimated to produce greater reductions than alternative practices that could be applied to the same land base.

All Forest Scenario

This scenario uses an all forest land use and current estimated atmospheric deposition loads for the 1991–2000 period and represents estimated loads with maximum reductions on the land including the elimination of fertilizer, point source, and manure loads. However, this scenario has loads greater than what would be estimated from a pristine scenario, which would have reduced input atmospheric deposition loads by about an order of magnitude, eliminated river reservoirs, and assumed a lower forest loading rate than that of modern forests and woodlands.