Phase 6 E3 and NoAction Model Scenarios

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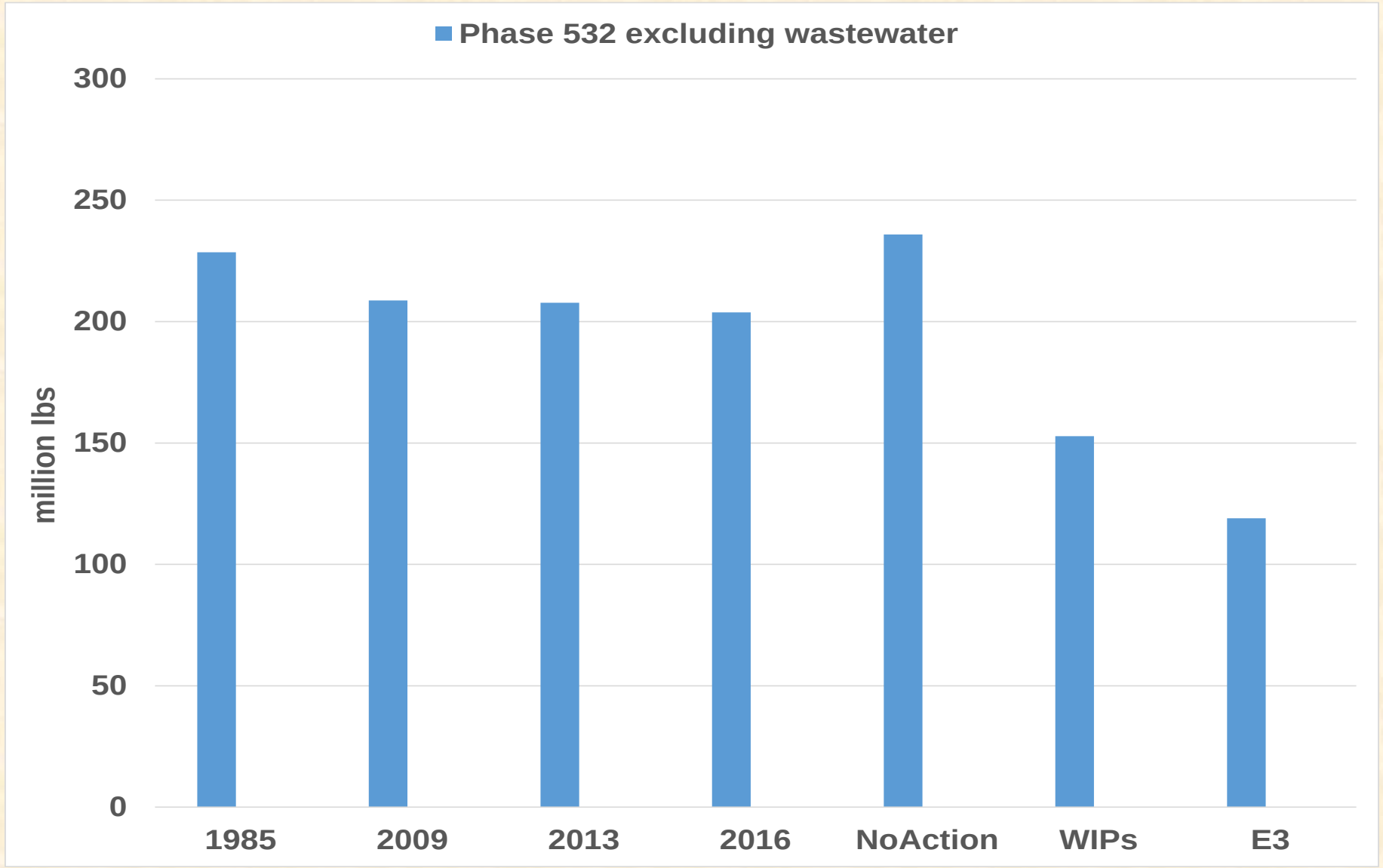
Agriculture Workgroup Meeting
UMD Wye Research & Education Center
Queenstown, MD
June 29, 2017

Initial Set of Phase 6 Model Scenarios

- 1985 – 2013 Progress, inclusive
  - BMP and wastewater data from jurisdictions for Phase 6 2014 Progress – 2016 Progress are due 9/1/17
- Phase II WIPs
- No-Action
- E3
  - No-Action and E3 are one component of the Planning Target calculations
  - Equity rule = Major river basins that contribute the most to the Bay water quality problems must do the most to resolve those problems (on a pound-per-pound basis)

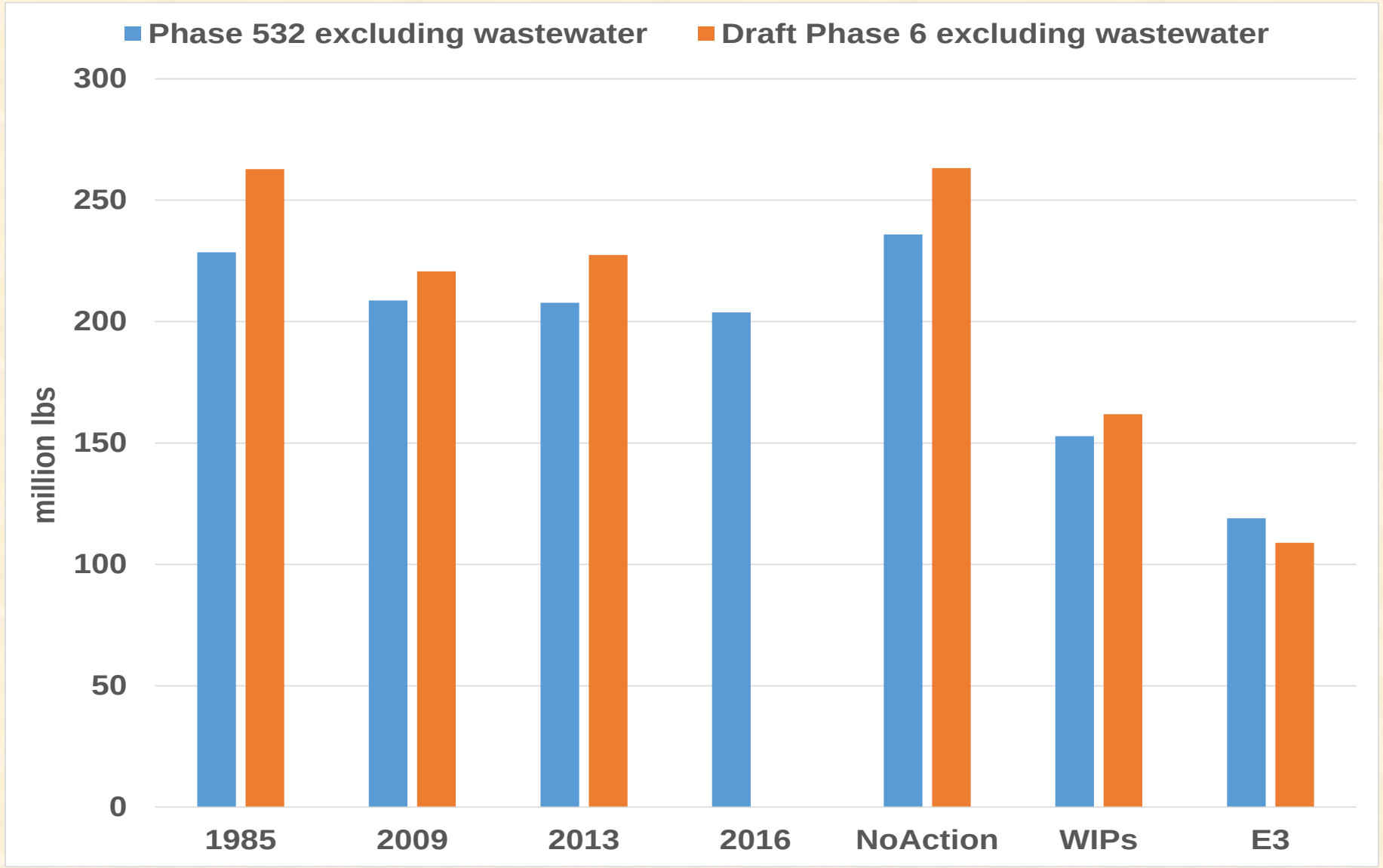
Phase 5

Nitrogen Loads, CB Watershed-wide (excludes wastewater)



Phase 5 and Phase 6

Nitrogen Loads, CB Watershed-wide (excludes wastewater)



Initial Set of Phase 6 Model Scenarios

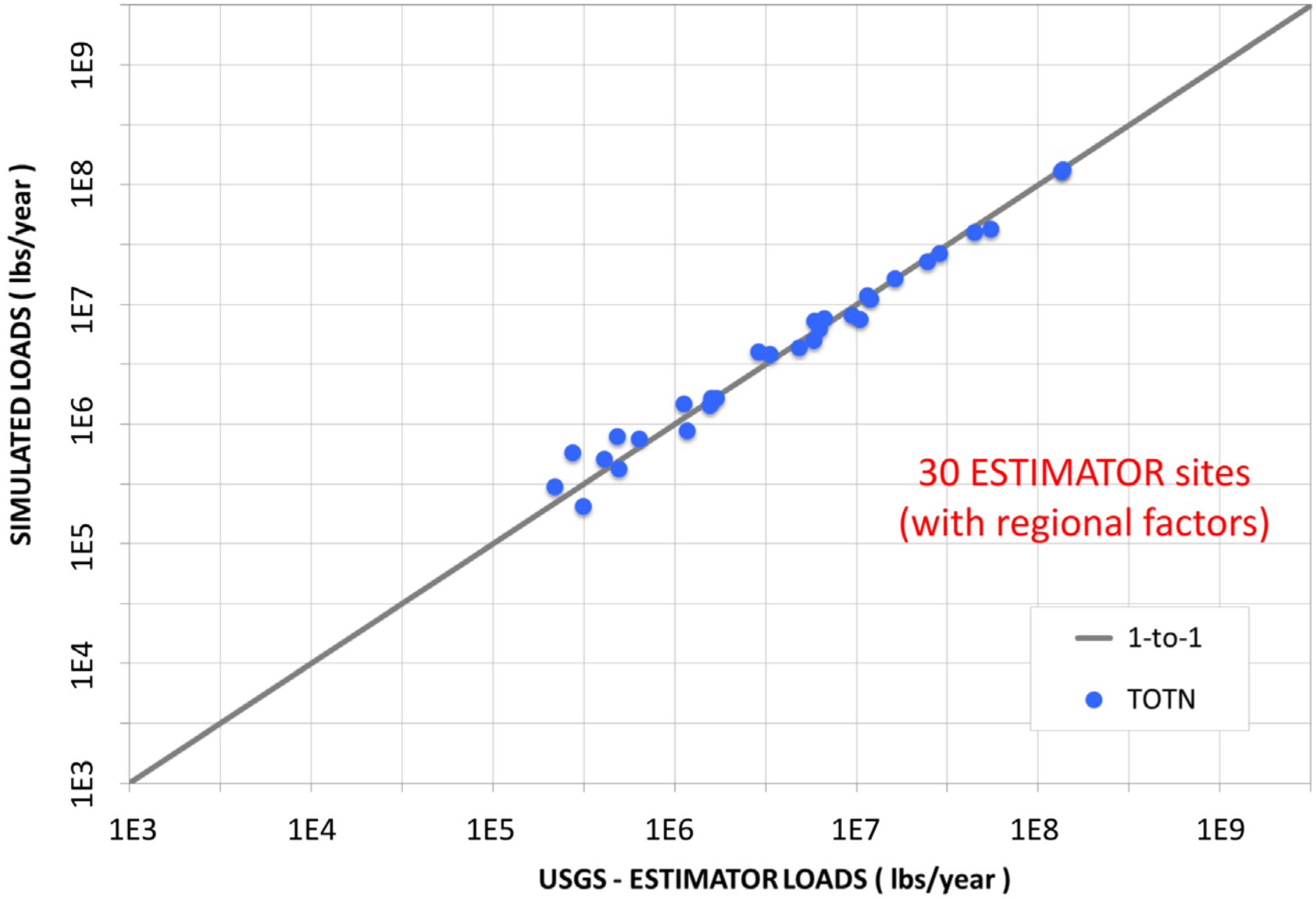
Big Changes from Phase 5 to Phase 6

- Inputs, inputs, inputs matter!
- High resolution land use
- Nitrogen simulation simplified using multiple model approach
- Phosphorus simulation tied to soil P
- Sediment simulation enhanced using NRCS RUSLE2 model
- Regional factors removed
- Calibration improved!

PHASE 5

Phase 5.3.2

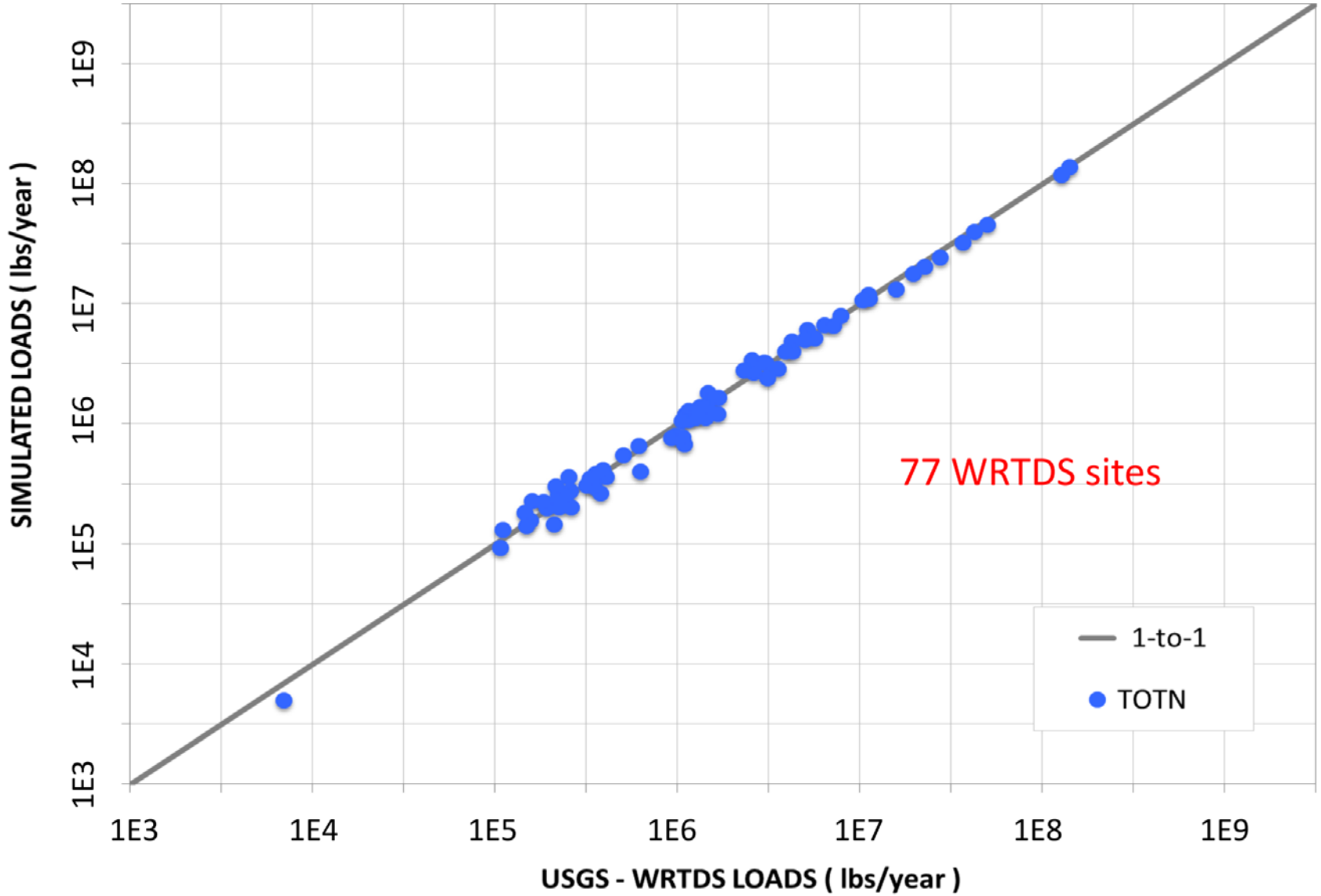
NITROGEN



DRAFT G

Revised inputs, model refinements, and calibration methods

NITROGEN



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Phase 5

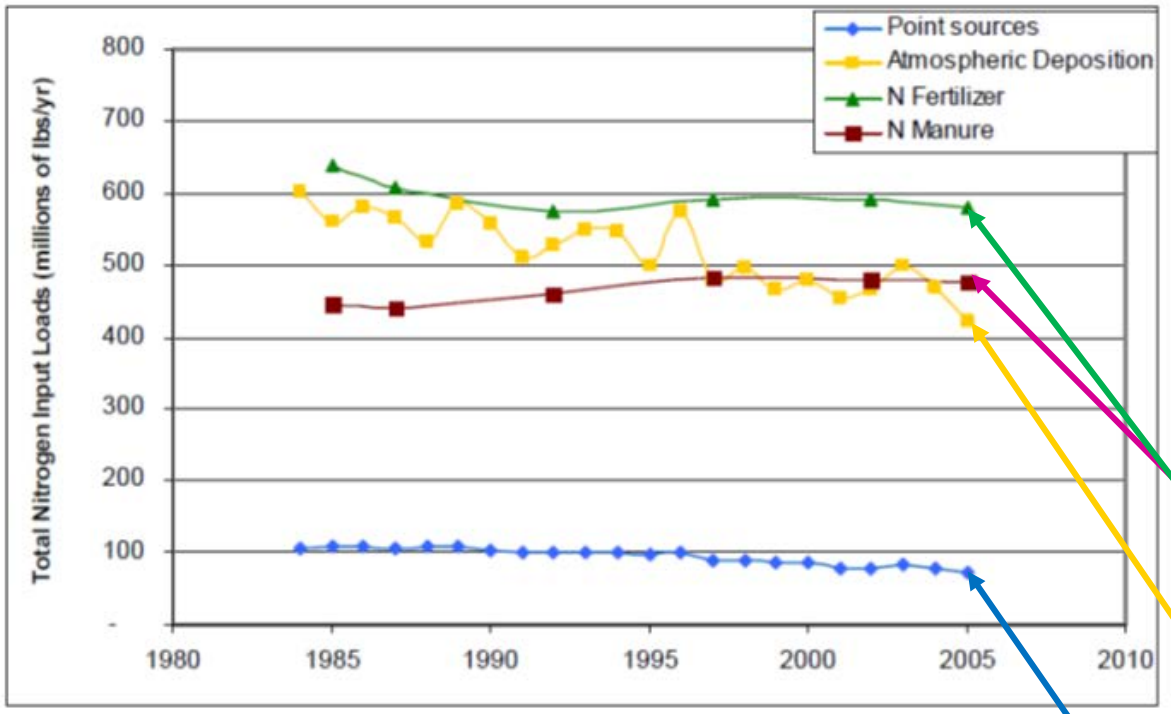
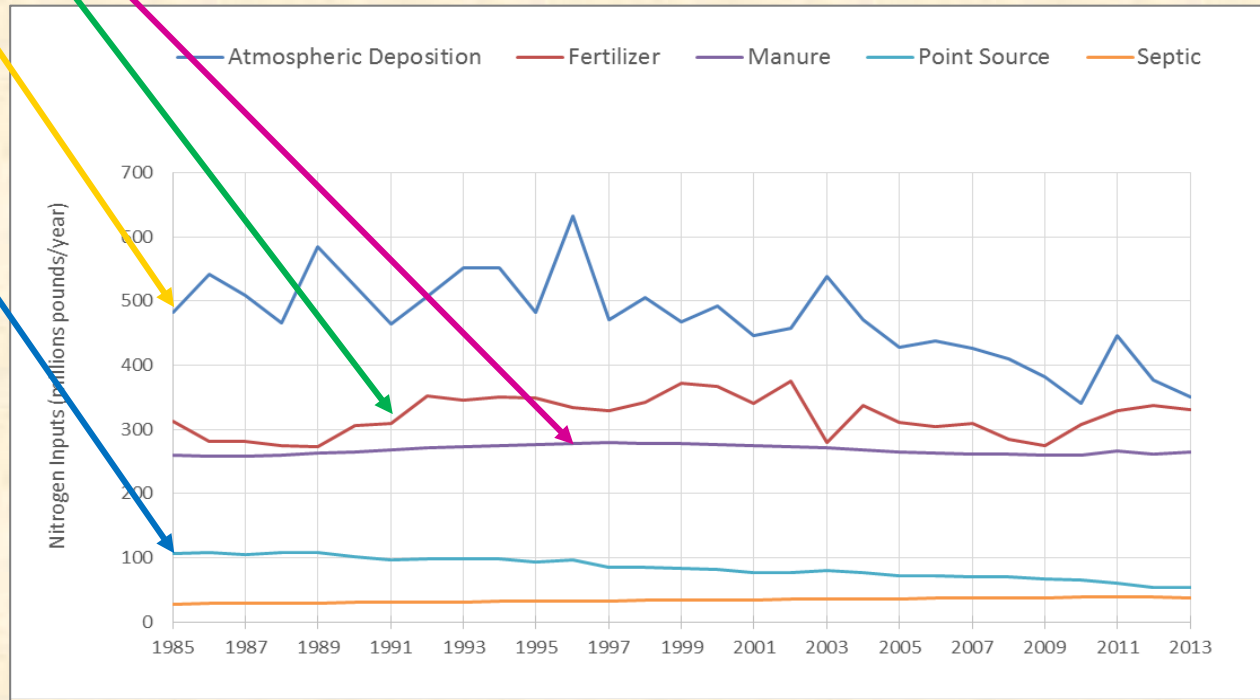


Figure 5-1. Time series of atmospheric, fertilizer, manure, and point source total nitrogen input loads to the Chesapeake Bay Watershed Model (Phase 5.3 calibration).

Phase 6



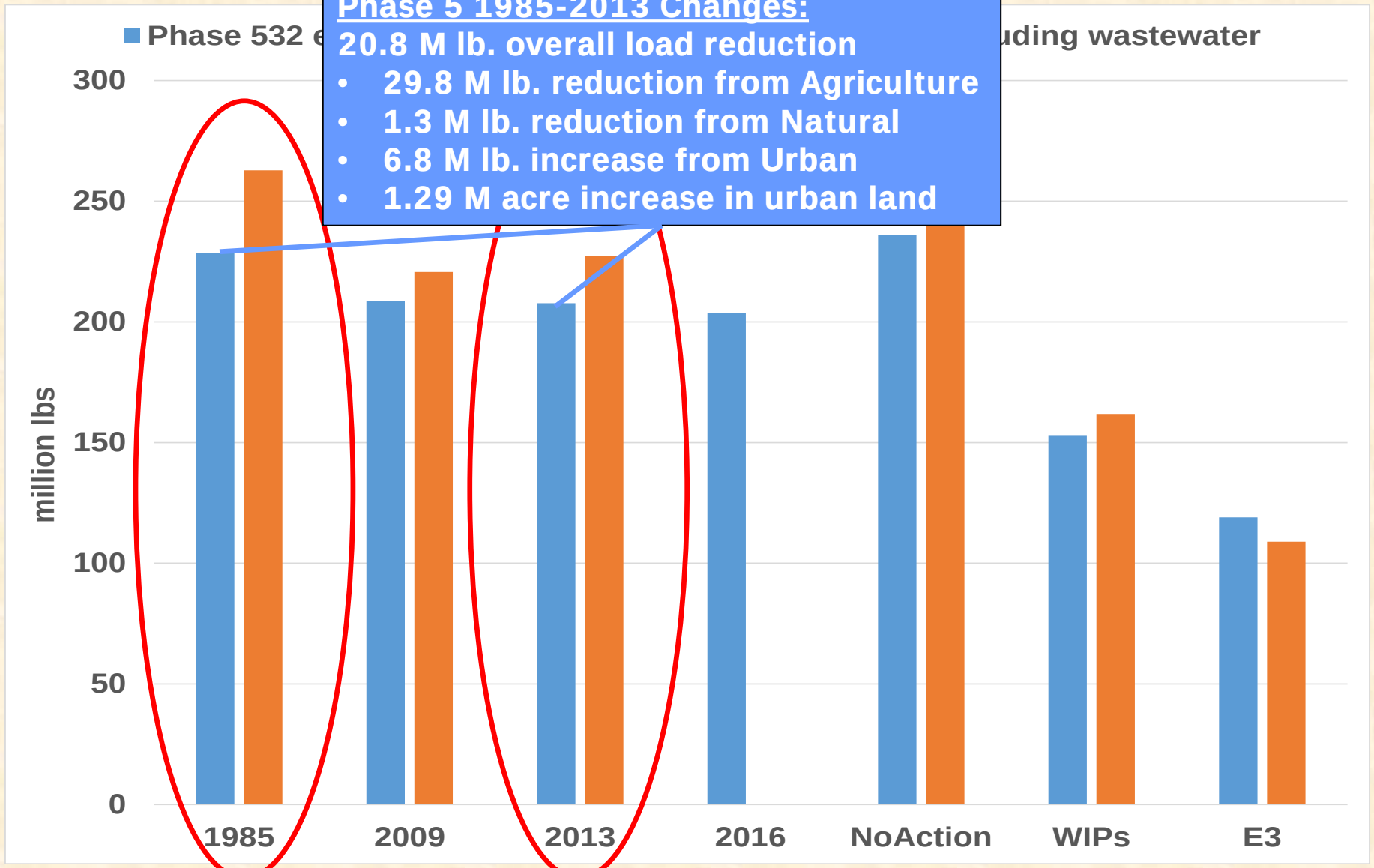
Phase 5 and Phase 6

Nitrogen Loads, CB Watershed-wide (excludes wastewater)

Phase 5 1985-2013 Changes:

20.8 M lb. overall load reduction

- **29.8 M lb. reduction from Agriculture**
- **1.3 M lb. reduction from Natural**
- **6.8 M lb. increase from Urban**
- **1.29 M acre increase in urban land**



Phase 5 and Phase 6

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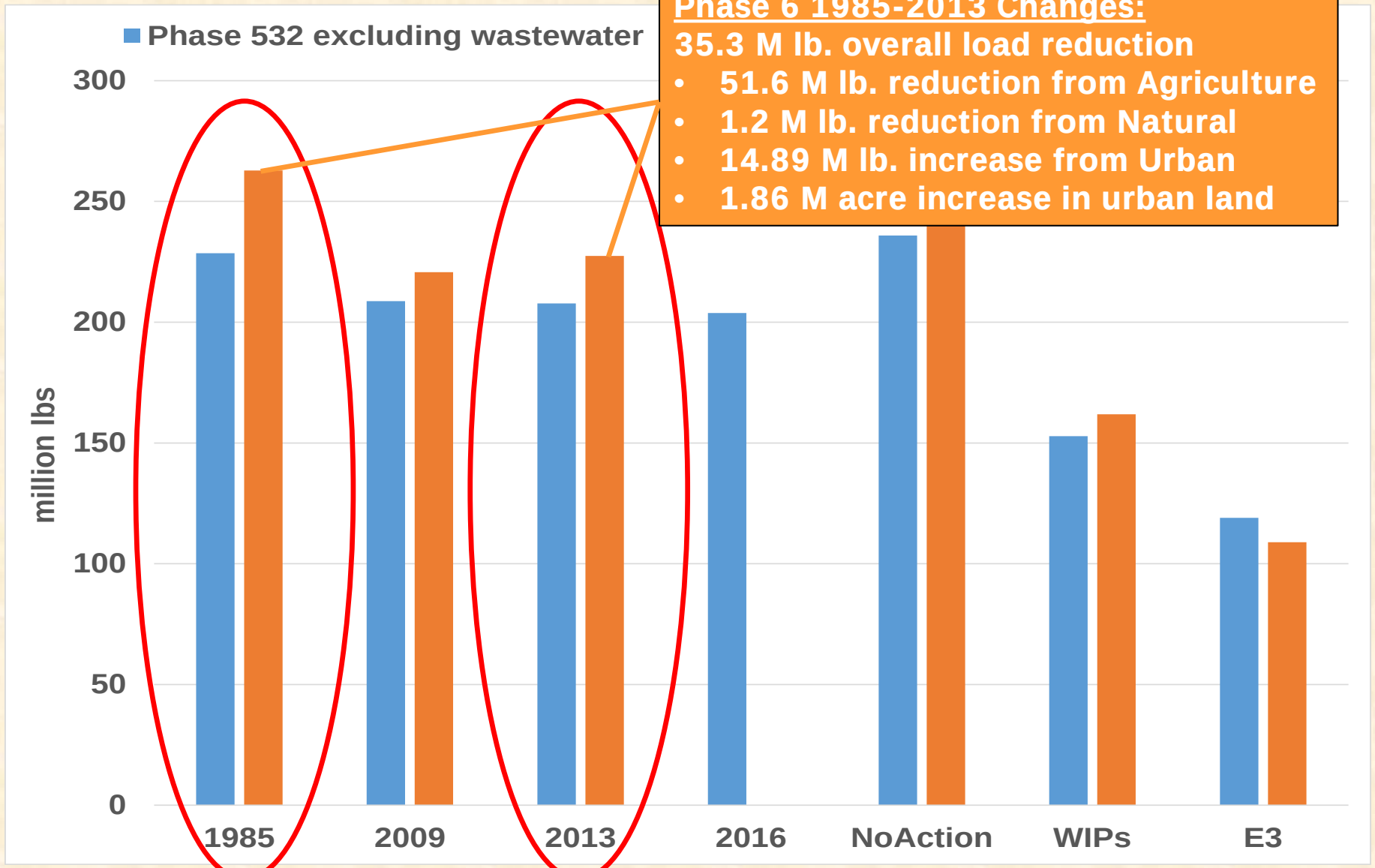


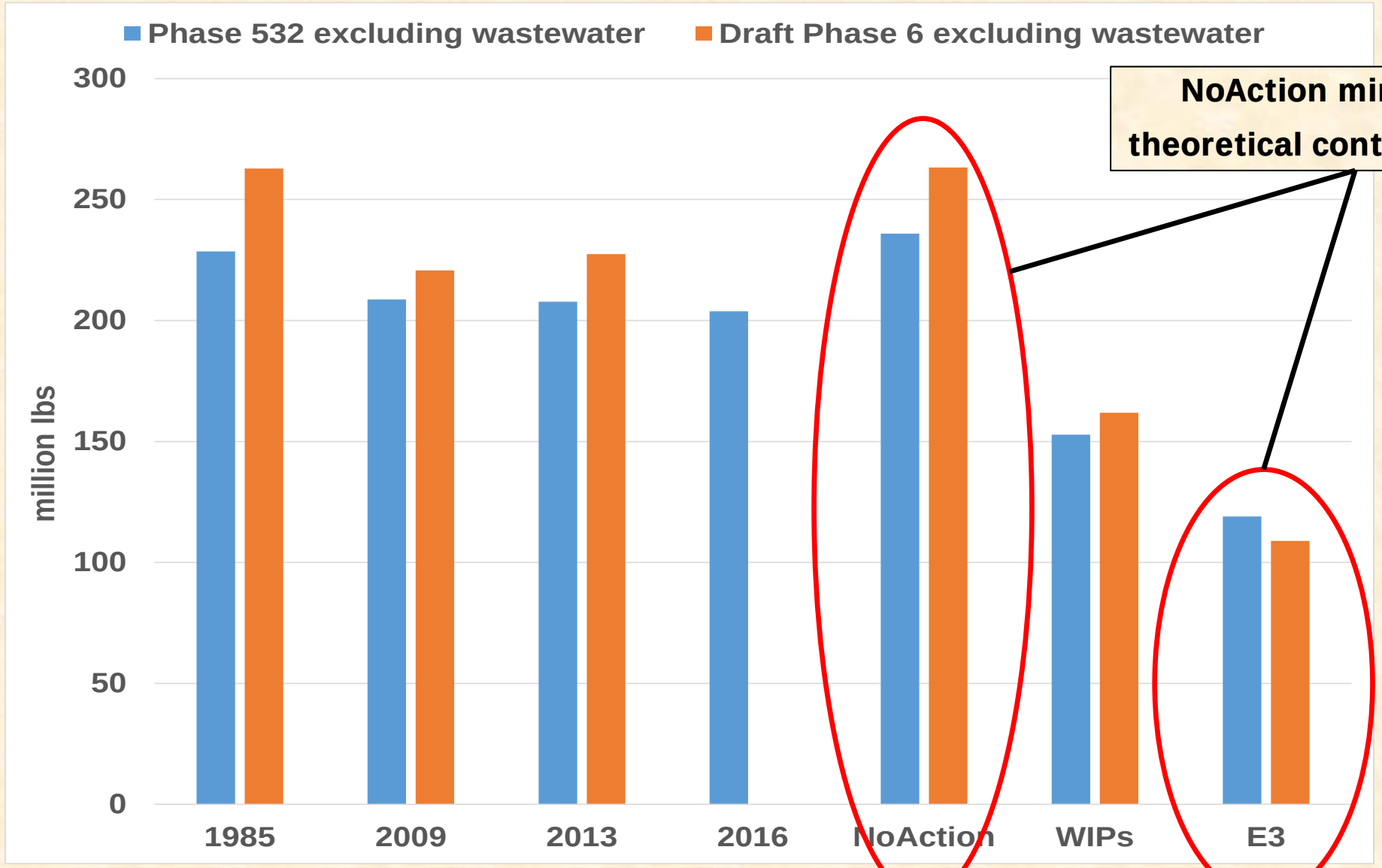
Phase 6 1985-2013 Changes:

35.3 M lb. overall load reduction

- **51.6 M lb. reduction from Agriculture**
- **1.2 M lb. reduction from Natural**
- **14.89 M lb. increase from Urban**
- **1.86 M acre increase in urban land**

Phase 5 and Phase 6

Nitrogen Loads, CB Watershed-wide (excludes wastewater)

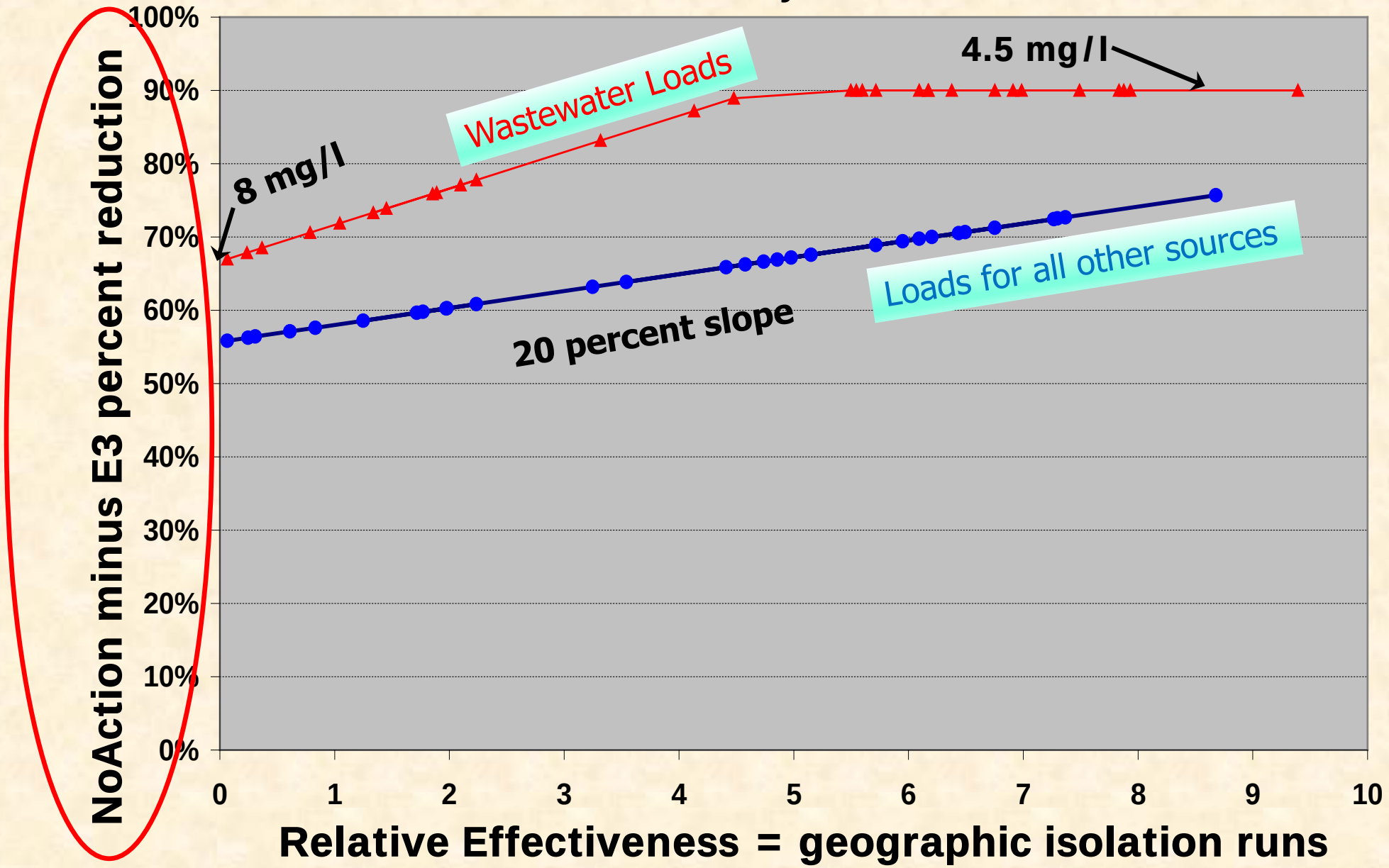


E3 Scenario

- Differences between No-Action and E3 scenario loads provide equity among regions of the CB watershed in that assumptions of point source controls and nonpoint source practice and program implementation levels for both scenarios are spatially universal.
  - Differences among regions occur because of more “inherent” differences in, for example:
    - animal and human populations,
    - number and types of wastewater facilities,
    - agricultural land types (crops and pasture) and areas,
    - urban land areas,
    - atmospheric deposition,
    - etc.

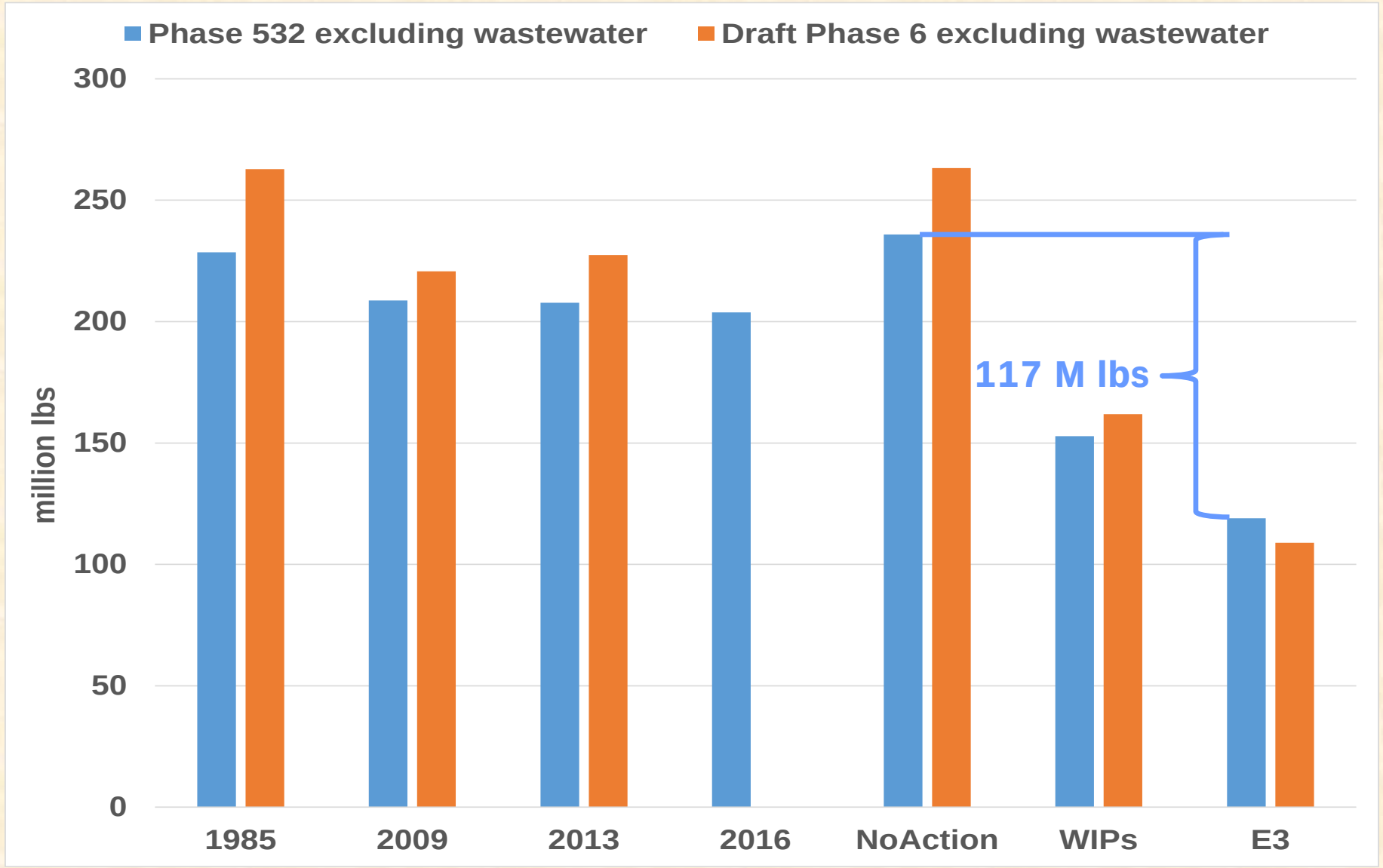
Phase 5 Planning Target Methodology

"Hockey Stick"



Initial Set of Phase 6 Model Scenarios

Nitrogen Loads, CB Watershed-wide (excludes wastewater)



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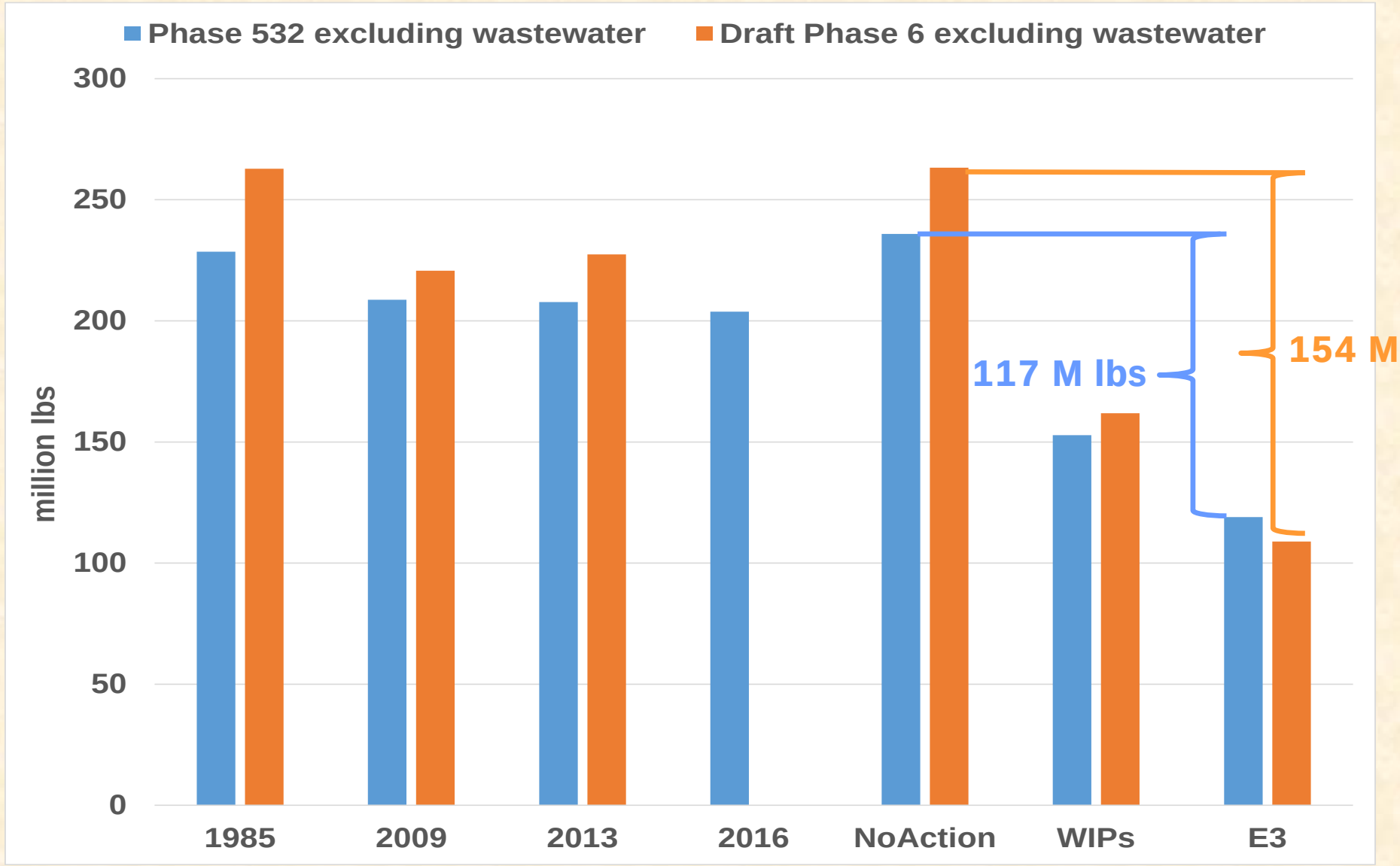

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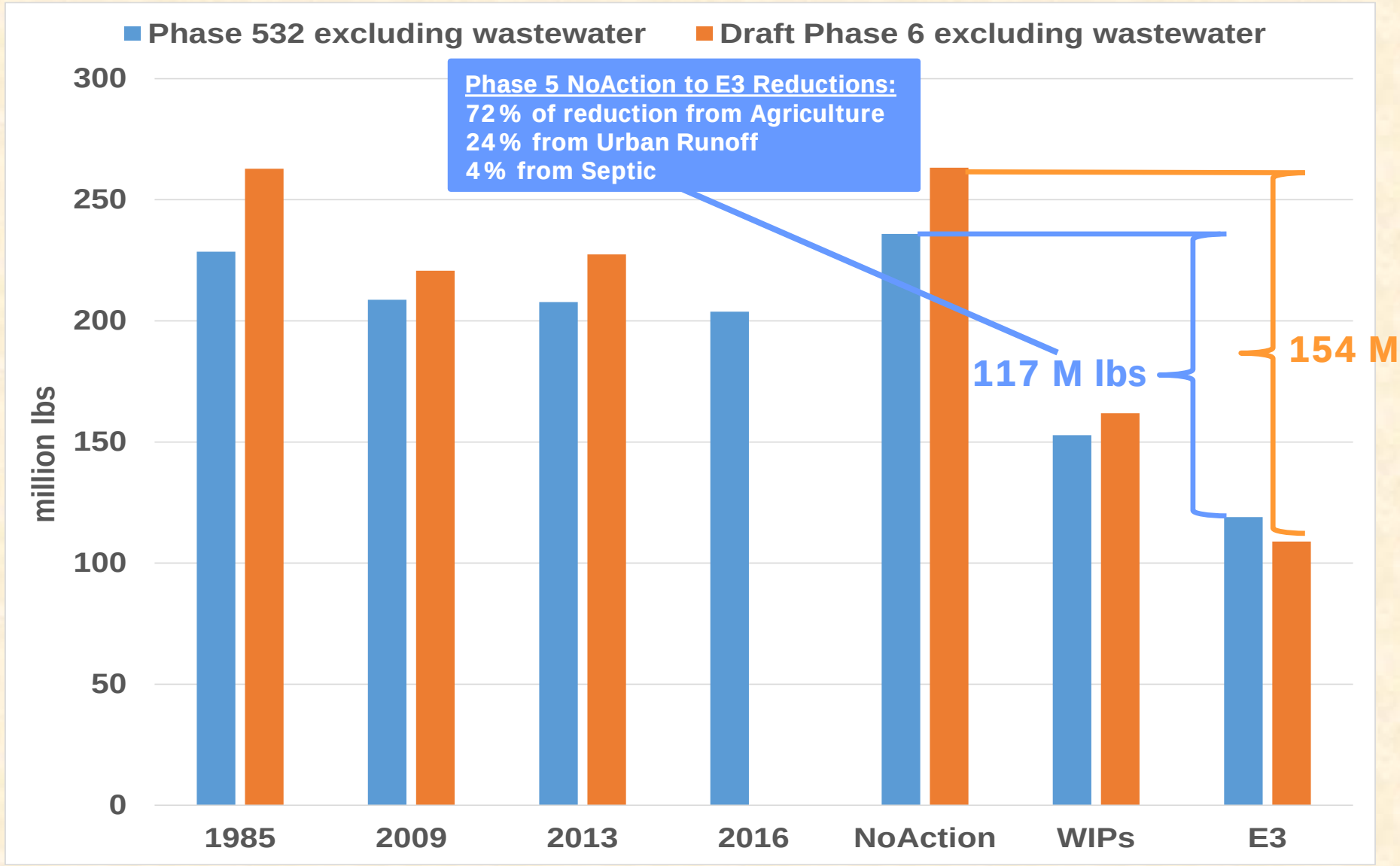

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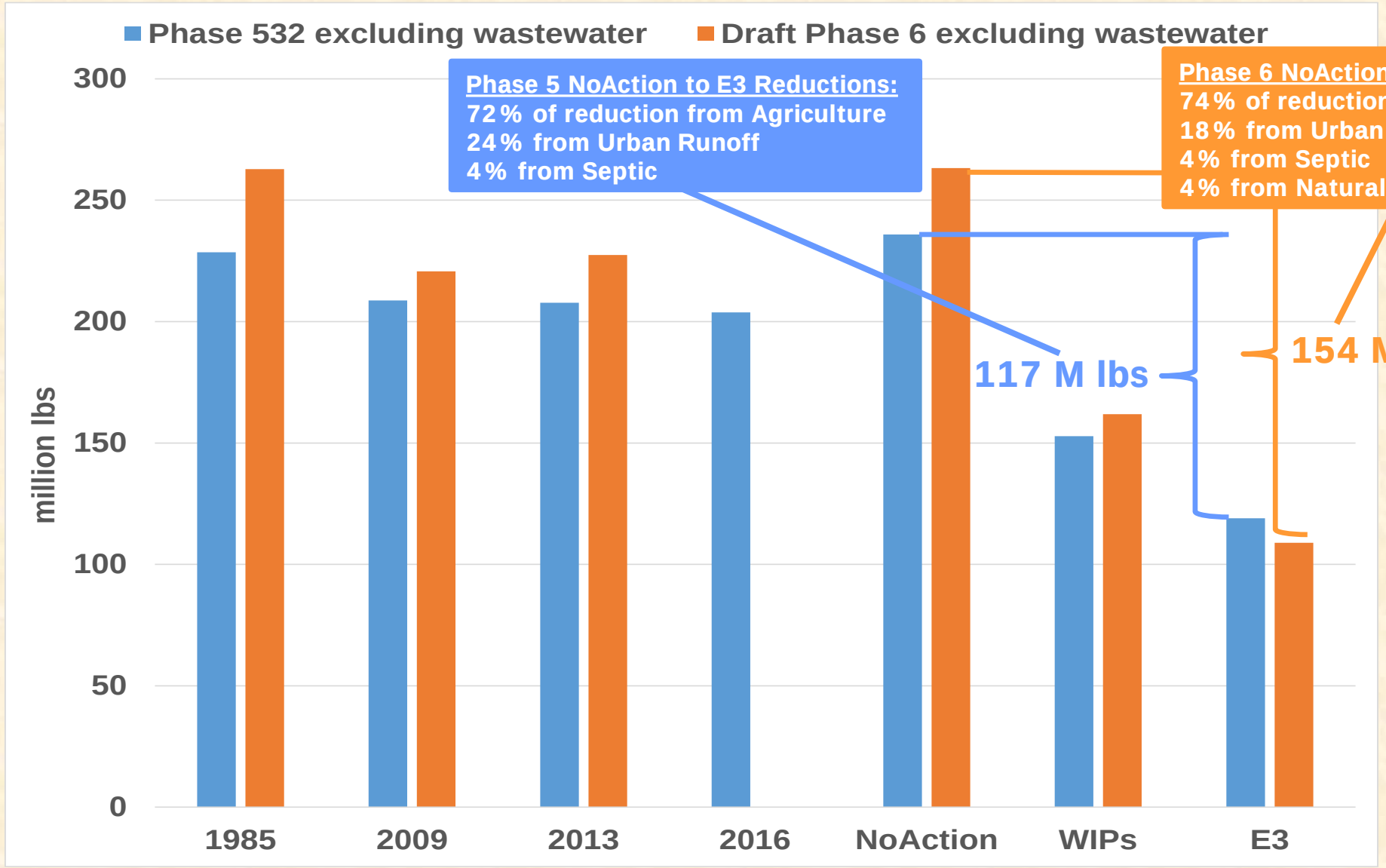


Phase 6 E3 Scenario

Agriculture BMPs

Phase 6 BMP	Implementation Level
Nutrient Management Core N, Nutrient Management Core P	100%
NM Supplemental: N and P Placement, N and P Rate, N and P Timing	100%
Tillage Management-High Residue/Minimal Soil Disturbance	100% of row crops (excluding corn silage and soybeans), and low input speciality crops
Tillage Management-Conservation Tillage	100% of select row crops including corn silage and soybeans, and high input speciality crops; excludes mushrooms, greenhouse and container nursery
Tillage Management-Low Residue Tilage	100% of select high input speciality 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 murshroom, greenhouse and container nursery; early, dri
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 speciality crops; excludes mushroom, greenhouse, and container nursery
Off Stream Watering Without Fencing	100%
Prescribed Grazing	100%; includes PIRG acres
Stream Access Control with Fencing	100%
Pasture Management Composite	100%
Forest Buffers	***~~10% of cropland~~ Crop land within 30m of all streams and rivers that's unbuffered - from high-resolution land cover***
Forest Buffer-Streamside with Exclusion Fencing	***~~5% of pasture~~ Pasture land within 30m of all streams and rivers that's unbuffered - from high-resolution land cover***
Wetland Restoration	1% of available crops and pasture
Land Retirement to Ag Open Space and to Pasture	7%
Tree Planting	3%
Alternative Crops	1% of row crop
Soil Conservation and Water Quality Plans	100%
Manure Injection	100%
Crop Irrigation Management	100%
Non-Ubran Stream Restoration	***Added since Oct, 2016 version***

Phase 6 E3 Scenario

Agriculture BMPs

Livestock Waste Management Systems	100%
Poultry Waste Management Systems	100%
Animal Waste Management Systems	100%
Livestock Mortality Composting	100%
Poultry Mortality Composting	100%
Mortality Composting	100%
Barnyard Runoff Control	100%
Loafing Lot Management	100%
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, exclues manure storage for dry manure/stackable manure

Phase 6 E3 Scenario

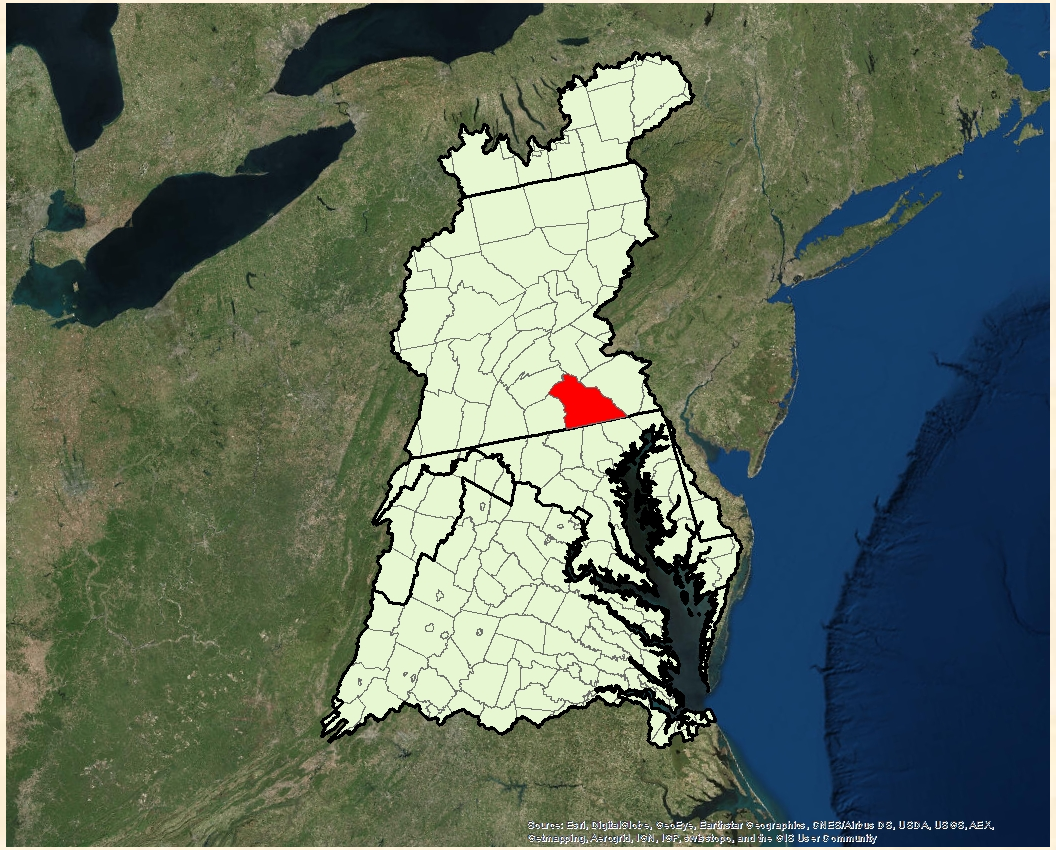
Forest Buffers

BMP	Phase 2 2015 Progress CBW (% Implementation)	Phase 2 2025 WIP CBW (% Implementation)	Phase 3 E3 CBW (% Implementation)
Forest Buffer	1.1%	3.1%	10% of cropland and 5% of pasture at 35 foot width

- New buffer data set was considered since 2016 version of Phase 3 E3:
  - Now have amount of land that has (does not have) trees in buffer zones along streams = better estimates of buffer-able area (acres) by LU type by width (10m and 30m)
  - For Phase 1 E3, buffered area was 15% of cropland and 10% of pasture
  - Will reinvestigate 10% of cropland and 5% of pasture at 35-foot width

Phase 6 E3 Scenario

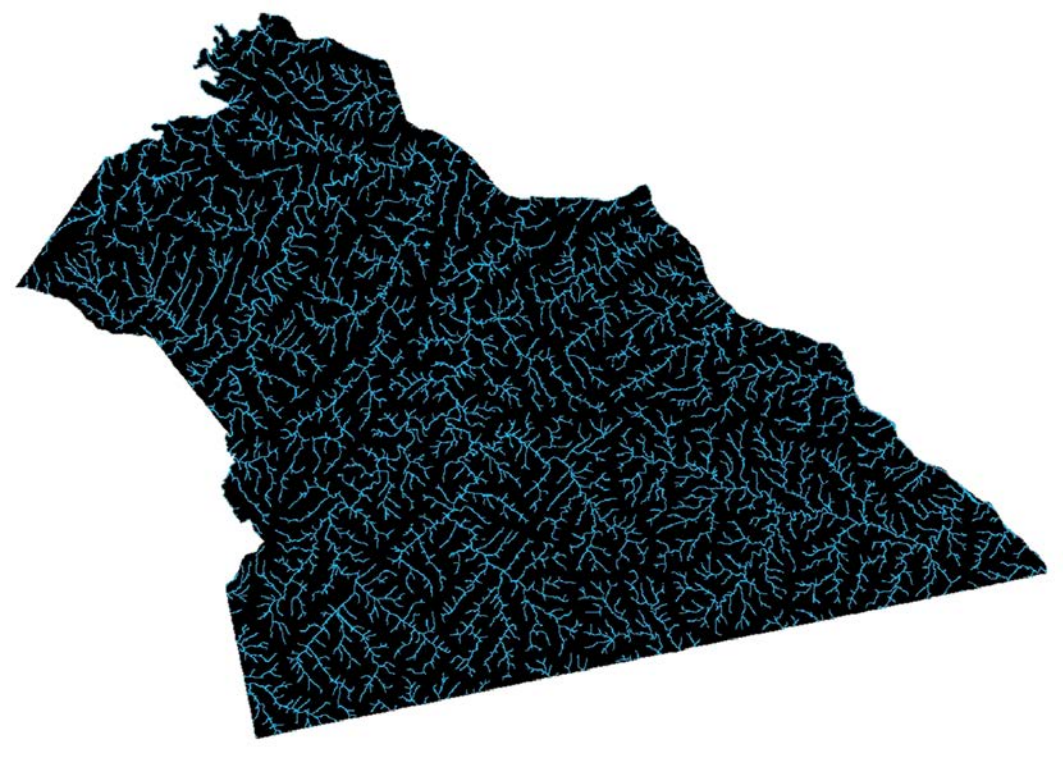
Forest Buffers



York, PA

Phase 6 E3 Scenario

Forest Buffers



Phase 6 Land Use:
Streams and Rivers

Phase 6 E3 Scenario

Forest Buffers

Agricultural land (crop & pasture) within 30m of all streams and rivers

Phase 6 E3 Scenario

Forest Buffers

Phase 6 E3 Scenario

Forest Buffers

Phase 6 E3 Scenario

Agriculture Changes Since Oct, 2016 Version

Phase 6 BMP	Implementation Level
~~Poultry Litter N and P Trends~~	~~100%, based on PLS Report Nutrient Trends~~; Removed this from Oct, 2016 version
~~Swine Manure N and P Trends~~	~~100%, based on Swine Manure Nutrient Characterization Project~~; Removed this from Oct, 2016 version
NonUrban Shoreline Erosion Control	Potential addition
Manure Transport	Will be added based on excess of crop goal
Manure Treatment Low/High Heat Gasification	May consider this if domain can be established and approved

Phase 6 E3 Scenario

Implementation Levels to Define or Not Use

- Manure Transport
  - Transport of excess manure in or out of a county. Manure may be of any type—poultry, dairy, or any of the animal categories. (ManureTransport)
  - E3 transport will be based on excess of crop goal.

Phase 6 E3 Scenario

Manure Treatment Technologies

BMP	Phase 2 2015 Progress CBW (% Implementation)	Phase 2 2025 WIP CBW (% Implementation)	Phase 3 E3 CBW (% Implementation)
Manure Treatment Slow Pyrolysis	N/A	N/A	0
Manure Treatment Forced Aeration	N/A	N/A	0
Manure Compost Forced Aeration High CN	N/A	N/A	0
Manure Compost Forced Aeration Low CN	N/A	N/A	0
Manure Compost Turned Pile Windrow	N/A	N/A	0
Manure Compost Turned Pile Windrow High CN	N/A	N/A	0
Manure Compost Turned Pile Windrow LowCN	N/A	N/A	0
Manure Compost Static Pile Windrow	N/A	N/A	0
Manure Compost Static Pile Windrow High CN	N/A	N/A	0
Manure Compost Static Pile Windrow Low CN	N/A	N/A	0
Manure Treatment Direct Monitor	N/A	N/A	0
Manure Treatment Fast Pyrolysis	N/A	N/A	0
Manure Treatment Low Heat Gasification	N/A	N/A	May consider this if domain can be determined
Manure Treatment High Heat Gasification	N/A	N/A	May consider this if domain can be determined
Manure Treatment Combustion	N/A	N/A	0
Manure Treatment High Heat Combustion	N/A	N/A	0
Manure Treatment Rotating Bin	N/A	N/A	0
Manure Treatment Rotating Bin High CN	N/A	N/A	0
Manure Treatment Rotating Bin Low CN	N/A	N/A	0

Phase 6 E3 Scenario

Implementation Levels to Define or Not Use

- Non Urban Stream Restoration
  - New stream length data set to consider since 2016 version of Phase 3 E3. (NonUrbStrmRest, StreamBedAndBank, feet) =
  - Stream miles from Chesapeake Conservancy synthetic data layer at lower order than National Hydrography Dataset (NHD)

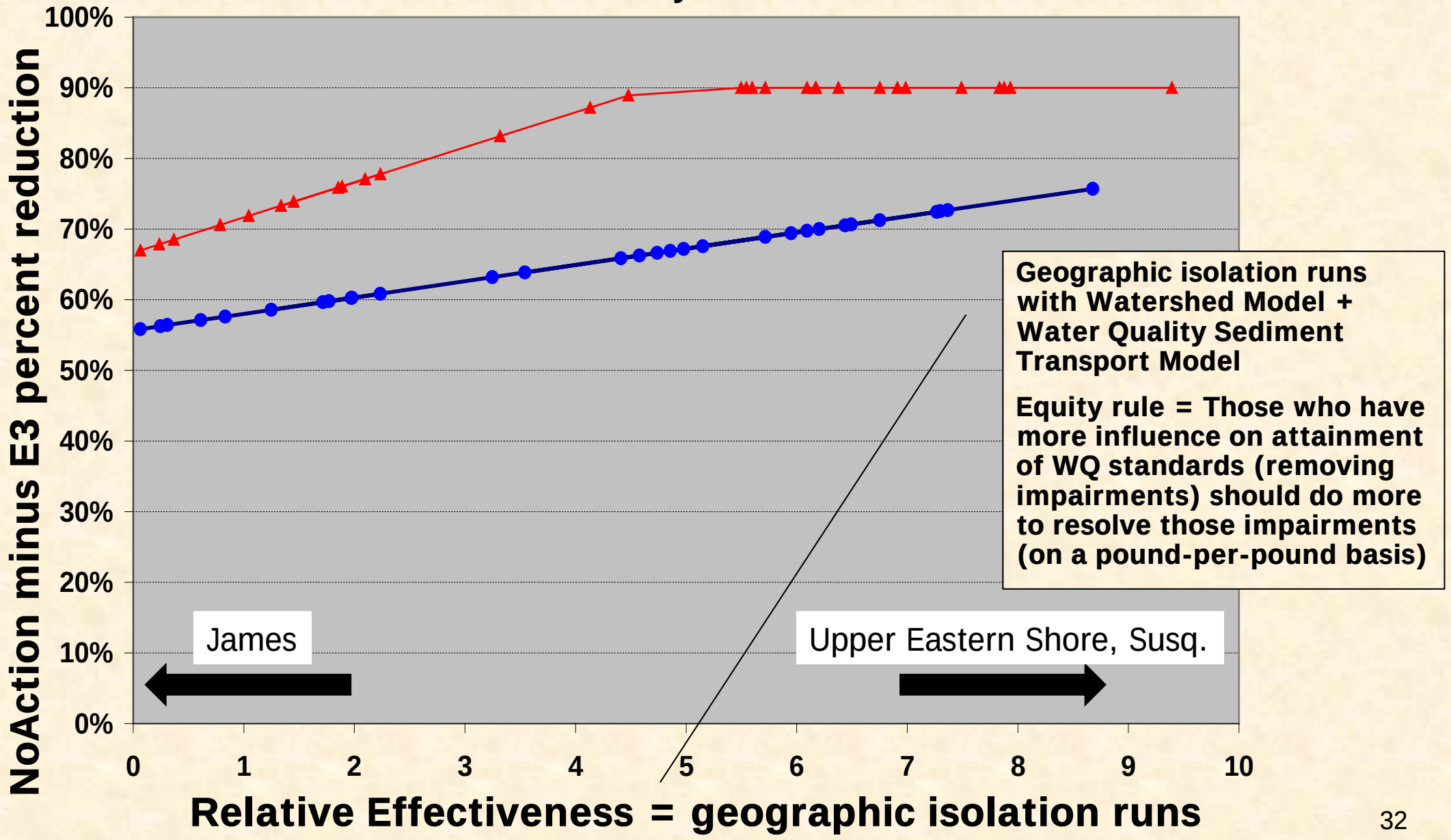
Phase 6 E3 Scenario

Implementation Levels to Define or Not Use

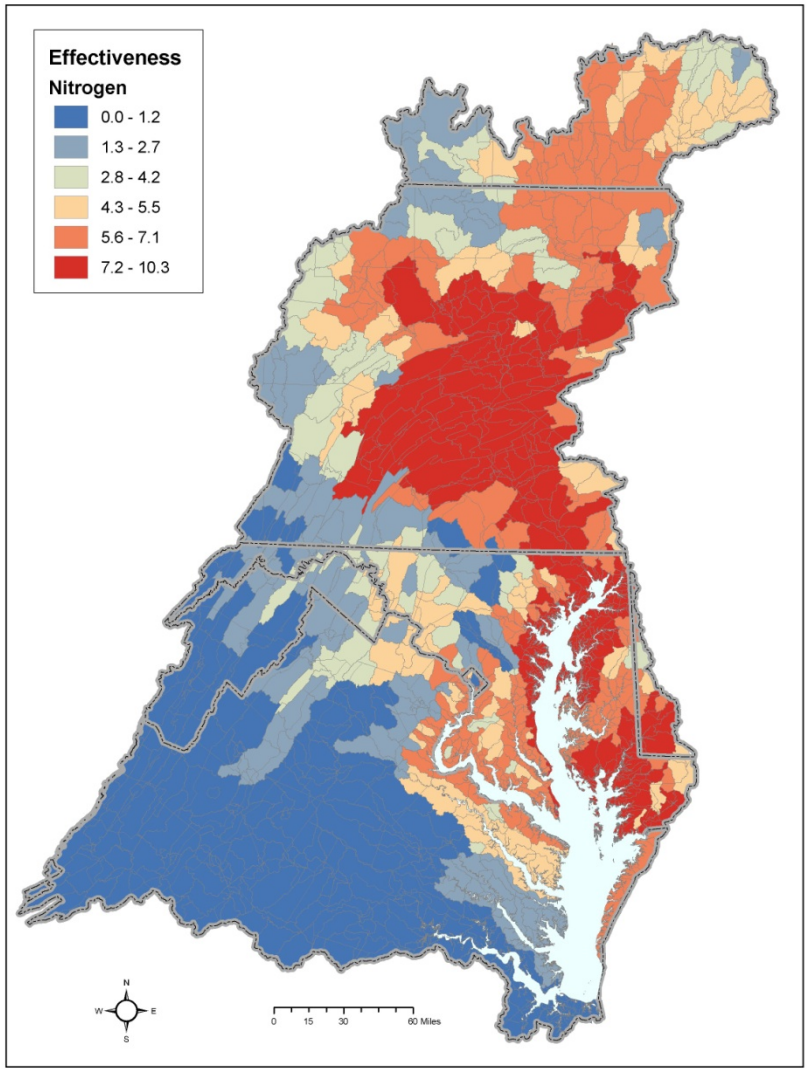
- Shoreline Management Agriculture
  - Any practice along agriculturally-dominated tidal shorelines that prevents and/or reduces tidal sediments to the Bay. Shoreline practices can include living shorelines, revetments and/or breakwater systems and bulkheads and seawalls.
    - Use “ShoreAg” if the specific design is not known.
    - If design is known, “ShoreAgVeg” and “ShoreAgNoVeg”
- Can use new buffer data set of buffered:unbuffered shoreline to define domain
  - By LU type by width (10m and 30m)

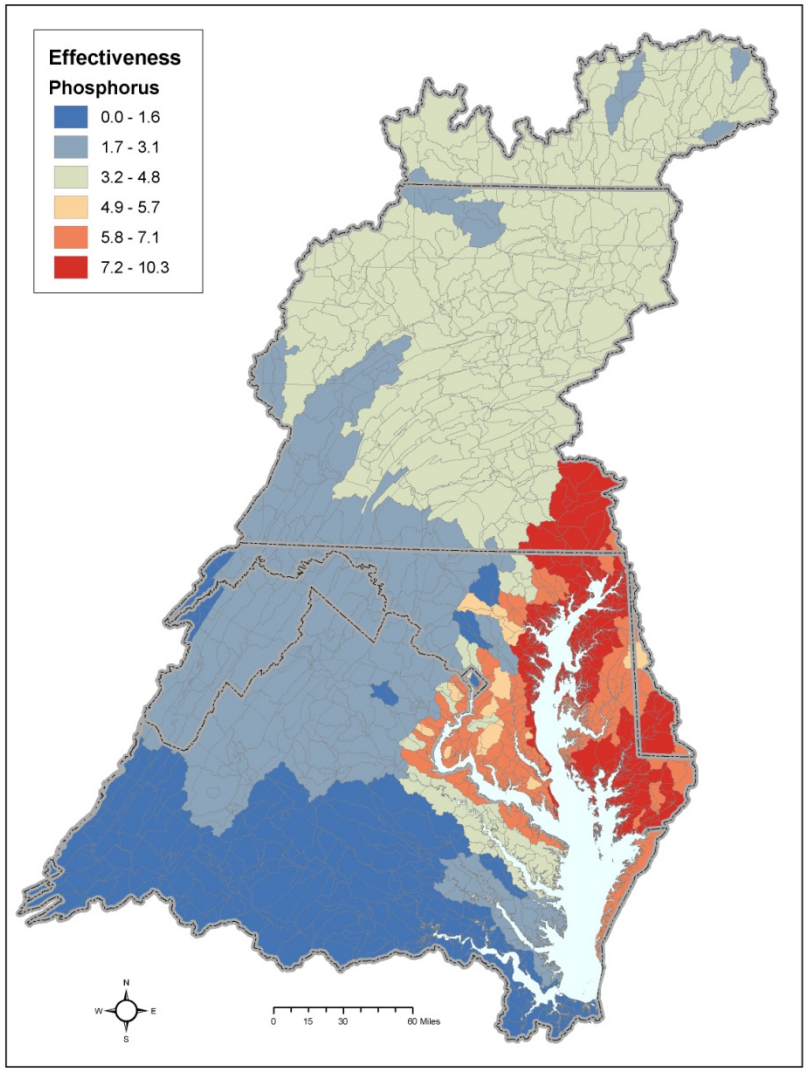
Phase 5 Planning Target Methodology

"Hockey Stick"

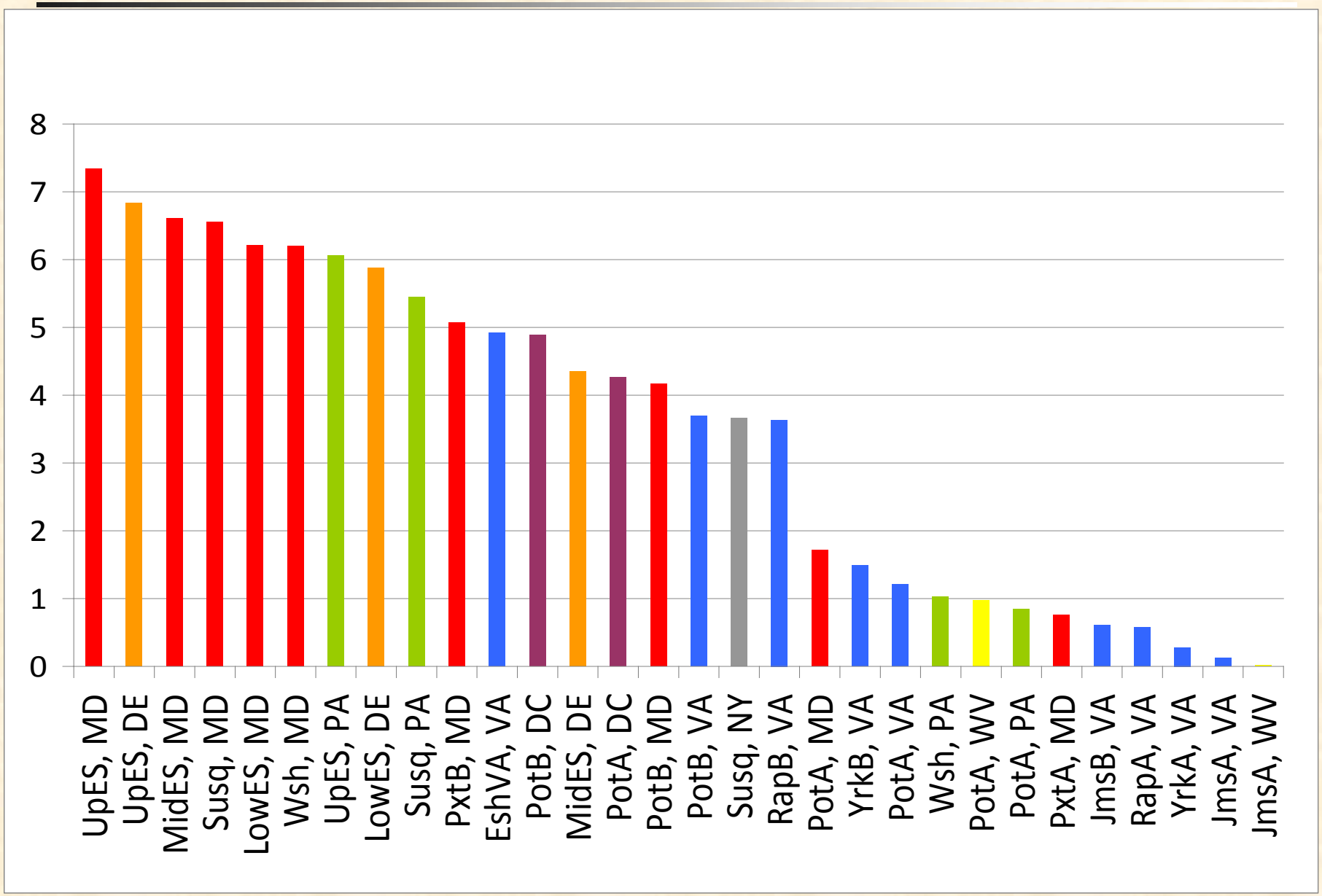


Relative Effect of a Pound of Pollution on Bay Water Quality





Major River Basin by Jurisdiction
Relative Impact on Bay Water Quality



Phase 6 Model Scenarios

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

Phase 6 Model Scenarios and Planning Target Development

Schedule

- Partnership's fatal flaw review of the Beta 6 modeling tools; through July 31, 2017

Phase 6 Model Scenarios and Planning Target Development

Schedule

- Partnership's fatal flaw review of the Beta 6 modeling tools; through July 31, 2017
- Fatal flaw issue resolution occurs in August, 2017
- WQGIT revisits midpoint assessment schedule based on Beta 6 fatal flaw review period; August 14, 2017 WQGIT call
- Partnership approval of Phase 6 modeling tools; September, 2017

Phase 6 Model Scenarios and Planning Target Development

Schedule

- Draft Phase III WIP planning target development; August 1 – September 30, 2017
  - No-Action, E3 + geo-isolation runs, etc.
- Release of draft Phase III WIP planning targets; October 31, 2017 - February 28, 2018 partnership review
- PSC approval of final Phase III WIP planning targets with special cases and release; March, 2018