Current Status of the Phase 6 Suite of Modeling Tools

Water Quality Goal Implementation Team
September 25, 2017

Lee Currey, MDE and Dave Montali, Tetra Tech with
Lew Linker, EPA-CBPO, Gary Shenk, USGS-CBPO and the Modeling Team

Chesapeake Bay Program
Science, Restoration, Partnership

"In my new role as Chair of the Principals' Staff Committee (PSC), I am committed to following through on the necessary decisions and work deliverables on time so we can proceed forward with developing and implementing our Phase III WIPs with the best available information and data. I am asking you as the WQGIT leadership and members to work collectively…. so that you can bring the WQGIT's recommendations to the October PSC retreat. We cannot afford any further delays in reaching agreement on the models and tools supporting our decision making as well as the needed decisions on how we are going to develop the draft Phase III WIP planning targets."

Secretary Ben Grumbles
August 2, 2017

Midpoint Assessment Priorities Identified in 2012 – The Charge to the Modeling Workgroup

- Update local land use and incorporate high resolution land cover data – **DONE**
- Update fertilizer and manure application – **DONE**
- Incorporate new and updated BMP efficiencies – **DONE**
- Update BMP historical record for 1985 – 2013; with data for 2014-2016 due September 1 – **DONE**
- Set overall land use loading rates – **DONE**
- Revise Modeling Structure – **DONE**

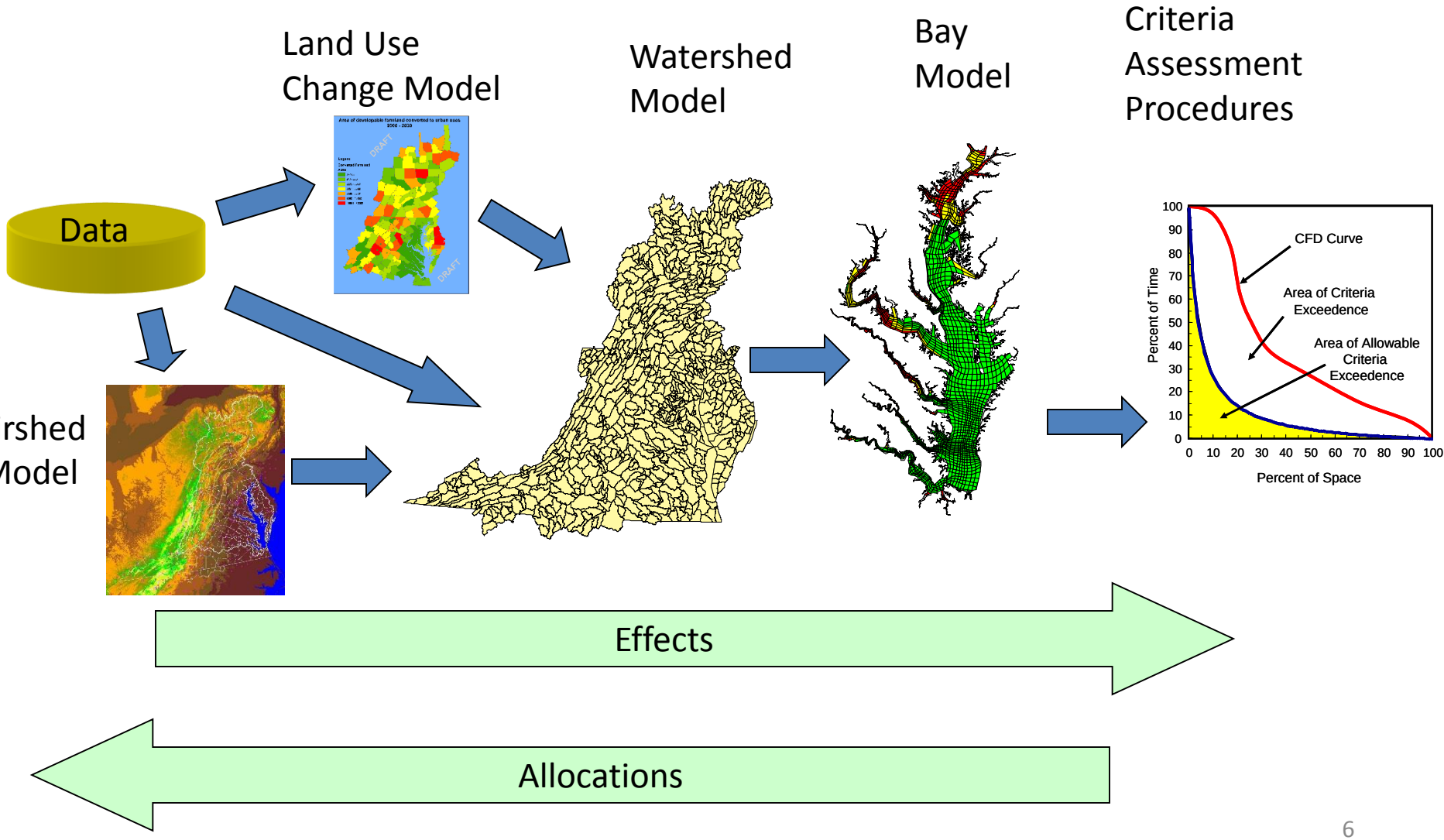
Midpoint Assessment Priorities Identified in 2012 – The Charge to the Modeling Workgroup

- Revisit watershed model calibration methods – **DONE**
- Incorporate multiple model estimates for sensitivity to nutrient inputs – **DONE**
- Simulate phosphorus in the soil and improve process simulation - **DONE**
- Provide the capability to simulate groundwater lag times – **DONE**
- Extend the watershed simulation period – **DONE**

Midpoint Assessment Priorities Identified in 2012 – The Charge to the Modeling Workgroup

- Incorporate new Community Multiscale Air Quality Model (CMAQ) air deposition estimates– **DONE**
- Incorporate new land use modeling for future buildout conditions – **DONE**
- Develop an approach to simulate effects due to Conowingo, and develop options for addressing such impacts – **DONE**
- Develop an approach to simulate effects due to climate change, and develop options for addressing such impacts – **DONE**

Decision Support System



Midpoint Assessment Modeling Peer Reviews

Review Title/Topic	Status	Sponsor
Chesapeake Bay Scenario Builder/Nutrient Input Approach	**Complete**	Watershed Technical Workgroup
Proposed revised James River chlorophyll *a* water quality criteria (Part I) And (Part II)	**Complete** **Complete**	Criteria Assessment Protocol Workgroup
Phase 6 Chesapeake Bay Watershed Model	**Complete**	Modeling Workgroup
Chesapeake Bay Water Quality/Sediment Transport Model (WQSTM)	Finalizing	Modeling Workgroup
Approach being taken to factor climate change considerations into the 2017 Midpoint Assessment	Finalizing	Climate Resiliency Workgroup

Source: Rachel Dixon and Bill Ball - CRC

Phase 6 Chesapeake Bay Watershed Model

Review Charge: Phase 6 is the most recent of a series of increasingly refined versions of the CBWM, and is a major departure from previous deterministic and mechanistic versions. The water quality simulation is an entirely new approach which relies on a structure based on multiple models. The panel is reviewing the Phase 6 Model with particular emphasis on the new multiple model aspects of the watershed simulation

Status: Excellent guidance, recommendations, and advice have been provided by the Phase 6 Watershed Model peer review report and a response to the report is being drafted. No fatal scientific errors identified.

Source: Rachel Dixon and Bill Ball - CRC

Reviewer	Affiliation
Zach Easton	VT, STAC
Don Scavia	U of Michigan
Doug Smith	USDA-ARS
Andrew Miller	UMBC, STAC
Peter Kleinman	USDA-ARS
Claire Welty	UMBC
Lawrence Band	UNC
Kathy Boomer	TNC, STAC
Rich Alexander	USGS
James Pizzuto	U of Del

Chesapeake Bay Water Quality/Sediment Transport Model (WQSTM)

Review Charge: The 2017 version of the WQSTM is the most recent of a series of coupled hydrodynamic and water quality models. New aspects include improved representation of the bioavailability of particulate organics and ability to simulate Conowingo infill and climate change in tidal waters. Refinements to the shallow water simulation include attenuation of nutrient/sediment loads through tidal wetlands, the representation of shoreline loads, and the explicit representation of oyster aquaculture, sanctuaries, and wild populations.

Status: The panel is finalizing the peer review. No fatal scientific errors were identified.

Reviewer	Affiliation
Damian Brady	U of Maine
Joe DePinto	Limnotech (retired)
Marjy Friedrichs	VIMS, STAC
Tom Jordan	SERC
Dominic DiToro	U of Delaware
Steven Chapra	Tufts
Meng Xia	UMES
Matt Gray	UMCES Horn Point

Source: Rachel Dixon and Bill Ball - CRC

Fatal Flaw Review

- Changes include
  - Documentation
  - E3 definitions
  - Land use changes
  - Agricultural and BMP Data Corrections
  - Soil P uncertainty
  - Additional streambank load in developed areas
  - Calibration methods
- Management Board Approved on 9/21/17

MB-approved soil P plan

- Statistical analysis of soil P
- Regional standards for soil P data
- Standardize collection and analytical methods across states
- Biennial collection and use in model
- STAC workshop on soil P in developed landscapes

Status of Phase 6

- September Version includes all recent comment resolutions other than calibration methods
- CAST version of September model will be ready around Oct 1
- Calibration beginning to produce final Phase 6 in October

Phase III WIP planning target development

- Draft No-Action and E3 Scenarios, geo-isolation runs, and Conowingo scenarios, climate change analyses are complete
- Review of planning targets, Conowingo infill analysis, and climate change influence by WQGIT at September 25-26, 2017 meeting.
- Review of planning targets, Conowingo infill analysis, and climate change influence by PSC at October 2017 meeting.
- Release of draft Phase III WIP planning targets; October 31, 2017 November 1, 2017 - February 28, 2018 for partnership review.
- PSC approval of final Phase III WIP planning targets with special cases and release - March, 2018.

Planning Target Method

Guidelines for Allocations

2010 TMDL

- Allocated N and P loads must result in attainment of water quality standards

- Areas that contribute the most to the problem must do the most to resolve the problem.

- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.

Guidelines for Allocations

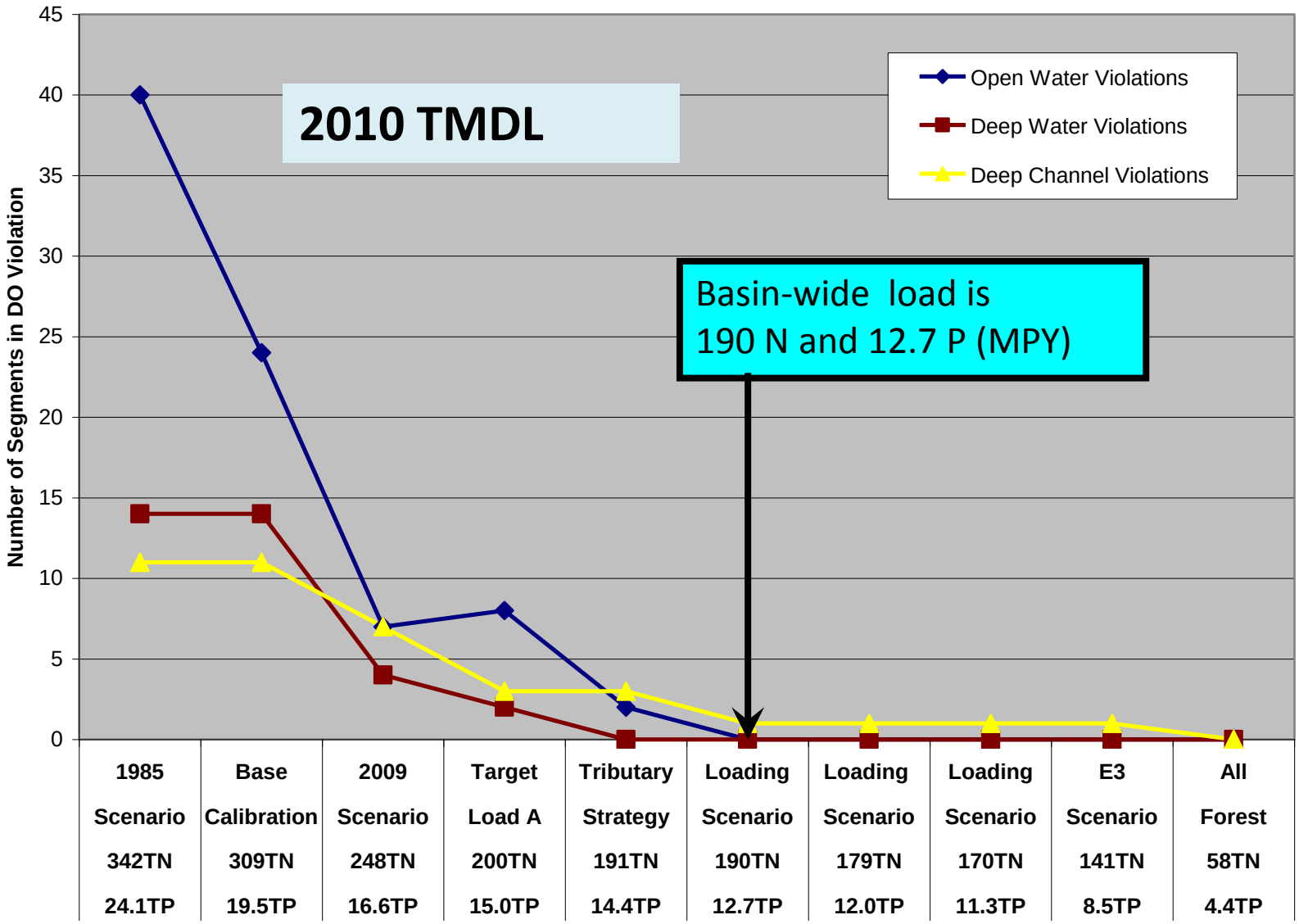
2010 TMDL

- Allocated N and P loads must result in attainment of water quality standards

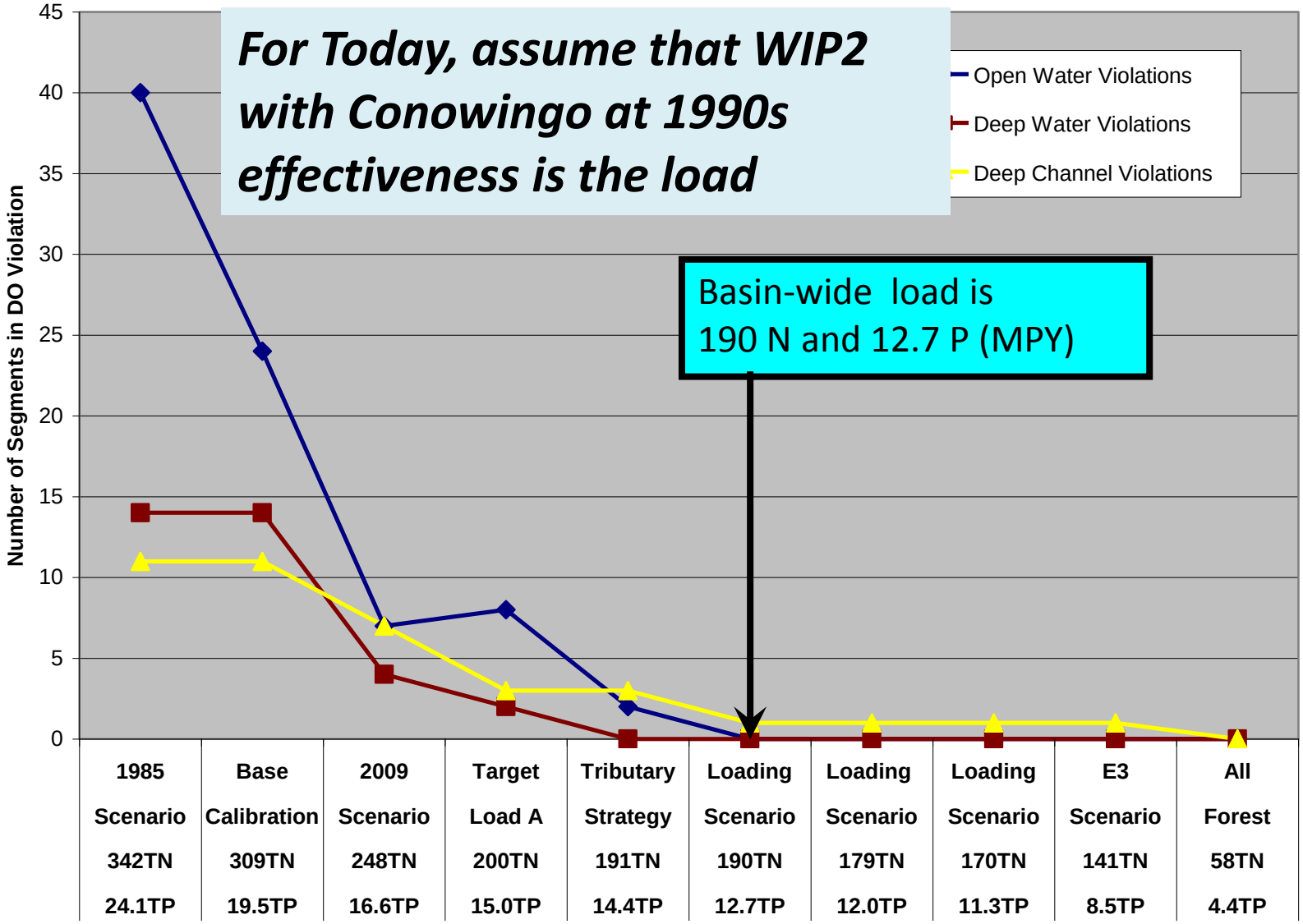
- Areas that contribute the most to the problem must do the most to resolve the problem.

- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.

Dissolved Oxygen Criteria Attainment



Dissolved Oxygen Criteria Attainment

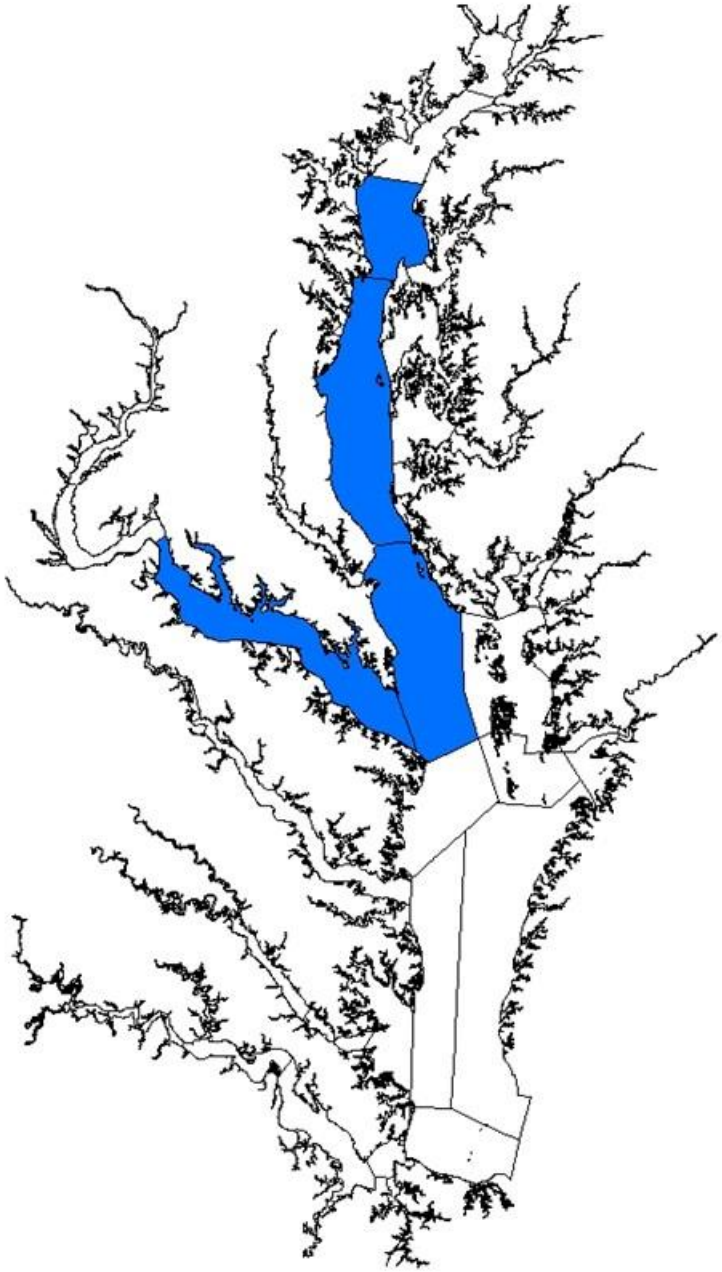


Guidelines for Allocations

2010 TMDL

- Allocated N and P loads must result in attainment of water quality standards
- Areas that contribute the most to the problem must do the most to resolve the problem.
- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.

Based on the effectiveness in increasing DO in CB3MH, CB4MH, and CB5MH Deep Water and Deep Channel; and POTMH Deep Water



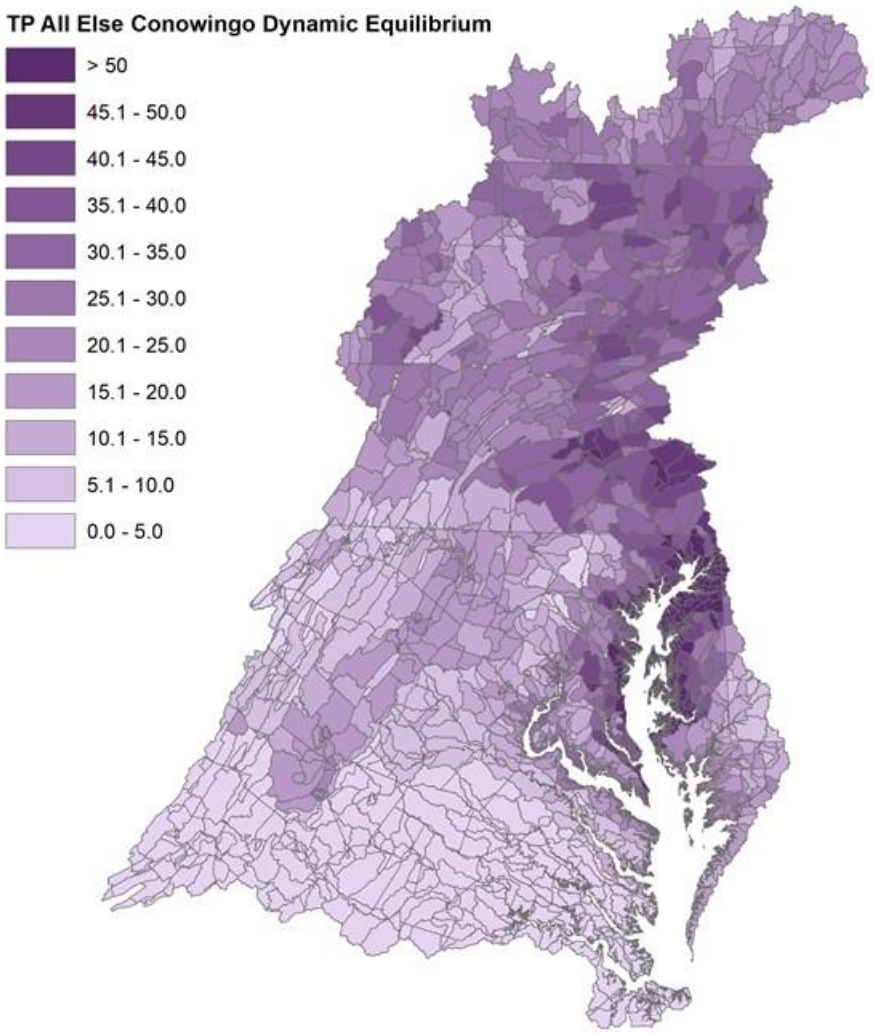
Determining Who Contributes the Most

Key factors:

Watershed Transport
- Watershed Characteristics
- Travel time
- Existence of impoundments

Position along mainstem bay
- Estuarine circulation

Existence of riverine estuary



Watershed delivery:
Pound delivered per pound produced
Estuarine delivery
Oxygen reduced per pound delivered
Overall Effectiveness
Oxygen reduced per pound produced

Guidelines for Allocations

2010 TMDL

- Allocated N and P loads must result in attainment of water quality standards

- Areas that contribute the most to the problem must do the most to resolve the problem.

- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.

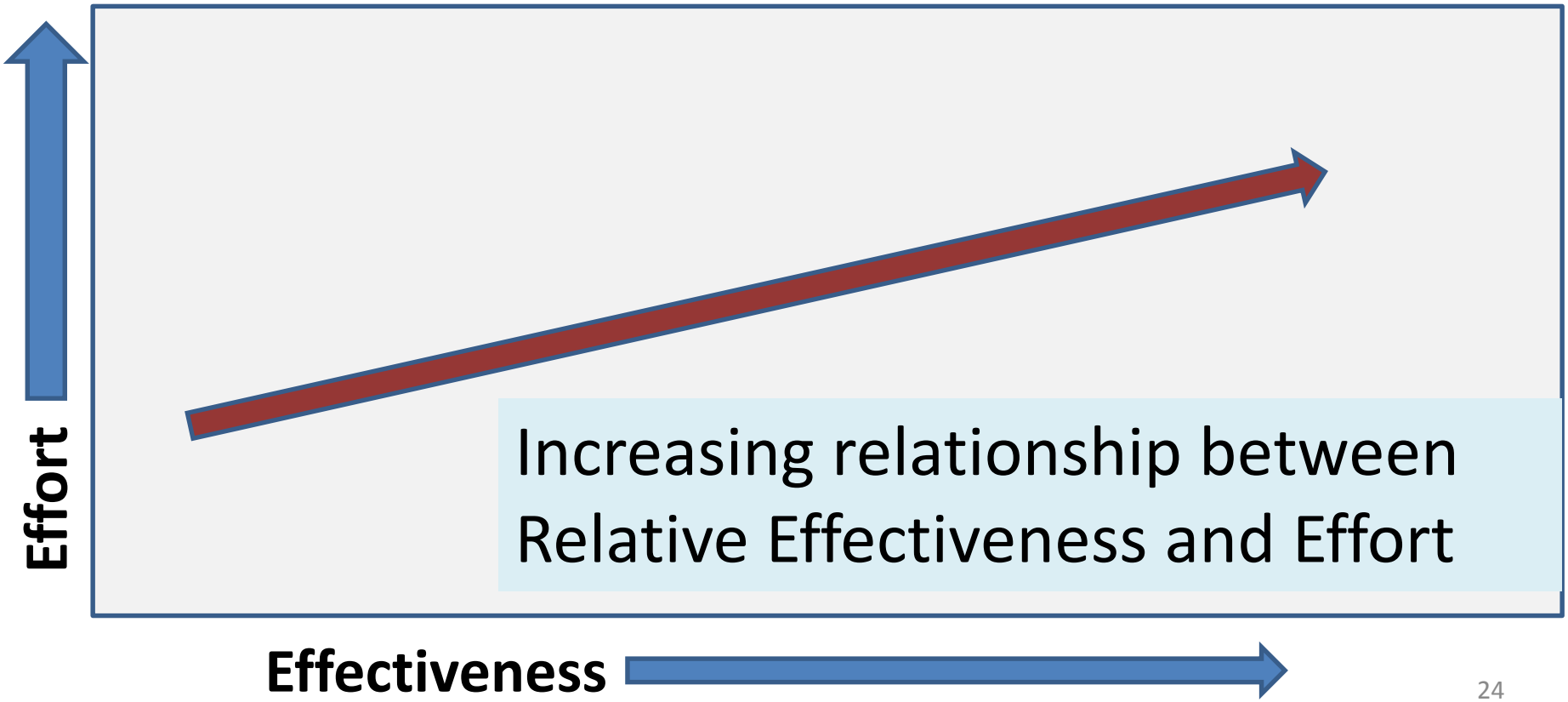
Accounting for Previous Reductions

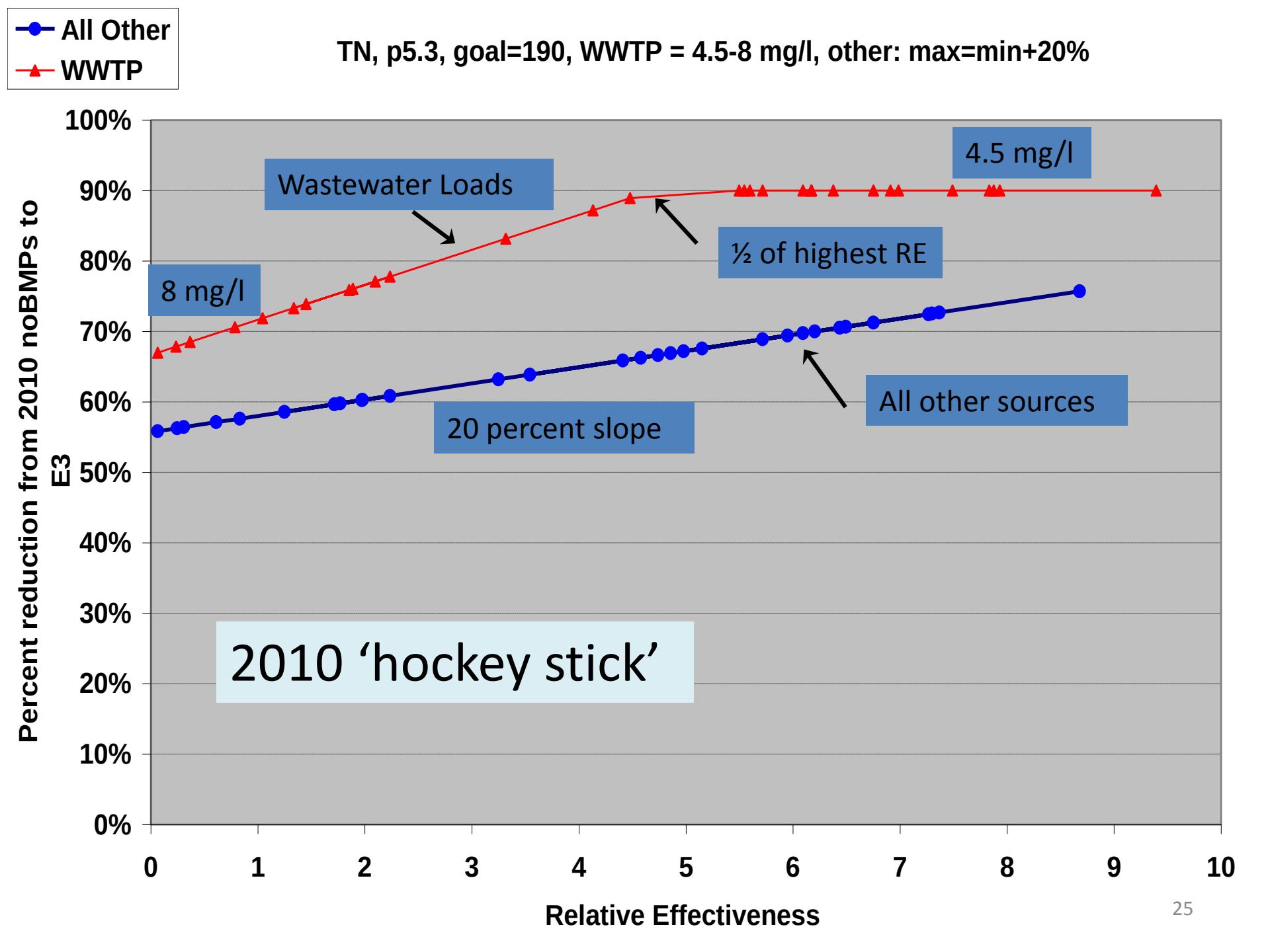
- A planning target method that requires all states to make a similar effort from here on out would disadvantage states that have already done more.

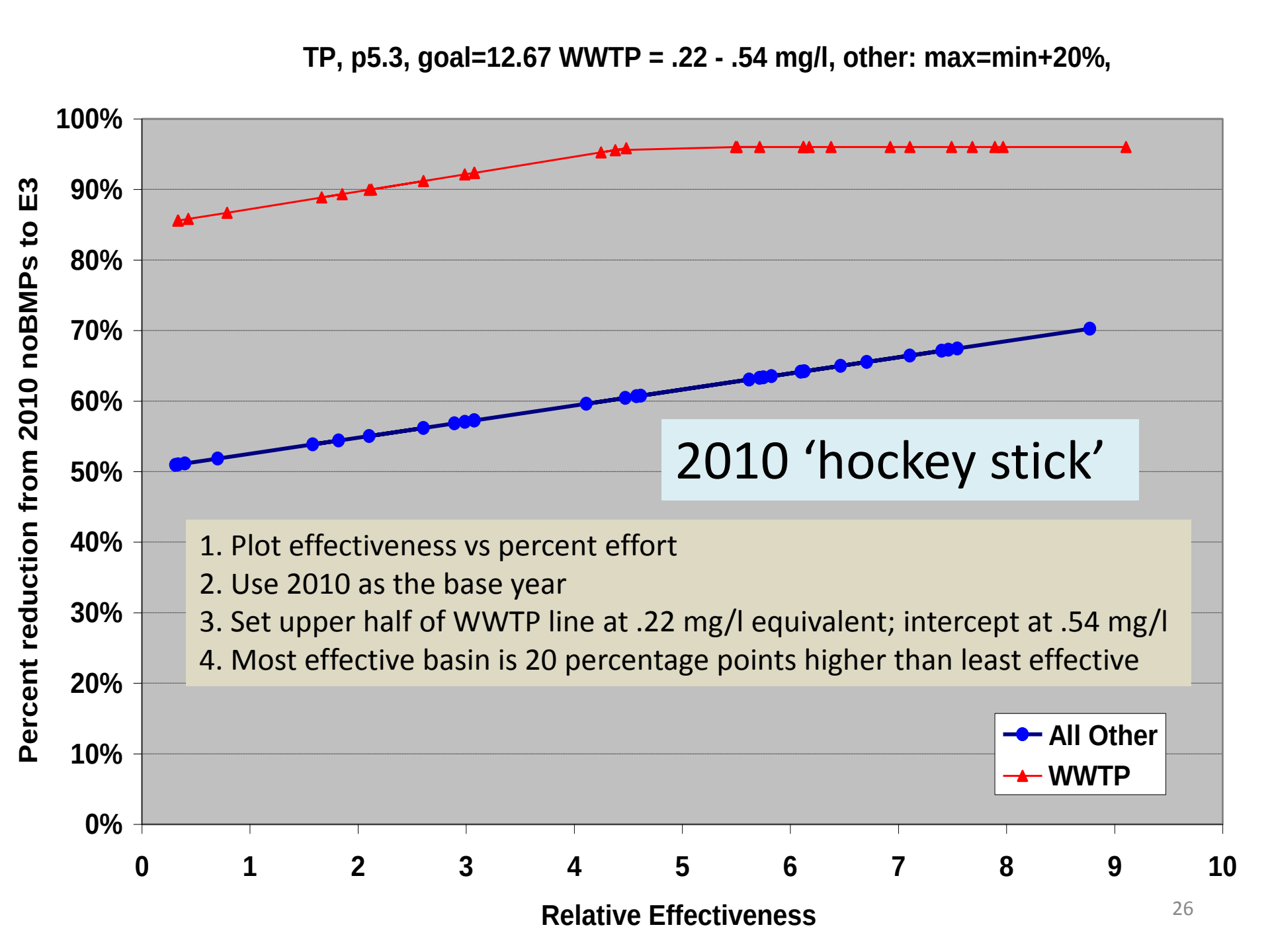
- Require a percentage of the way between:
  - No Action: no BMPs, low level of WWTP
  - Everyone, Everything, Everywhere (E3)

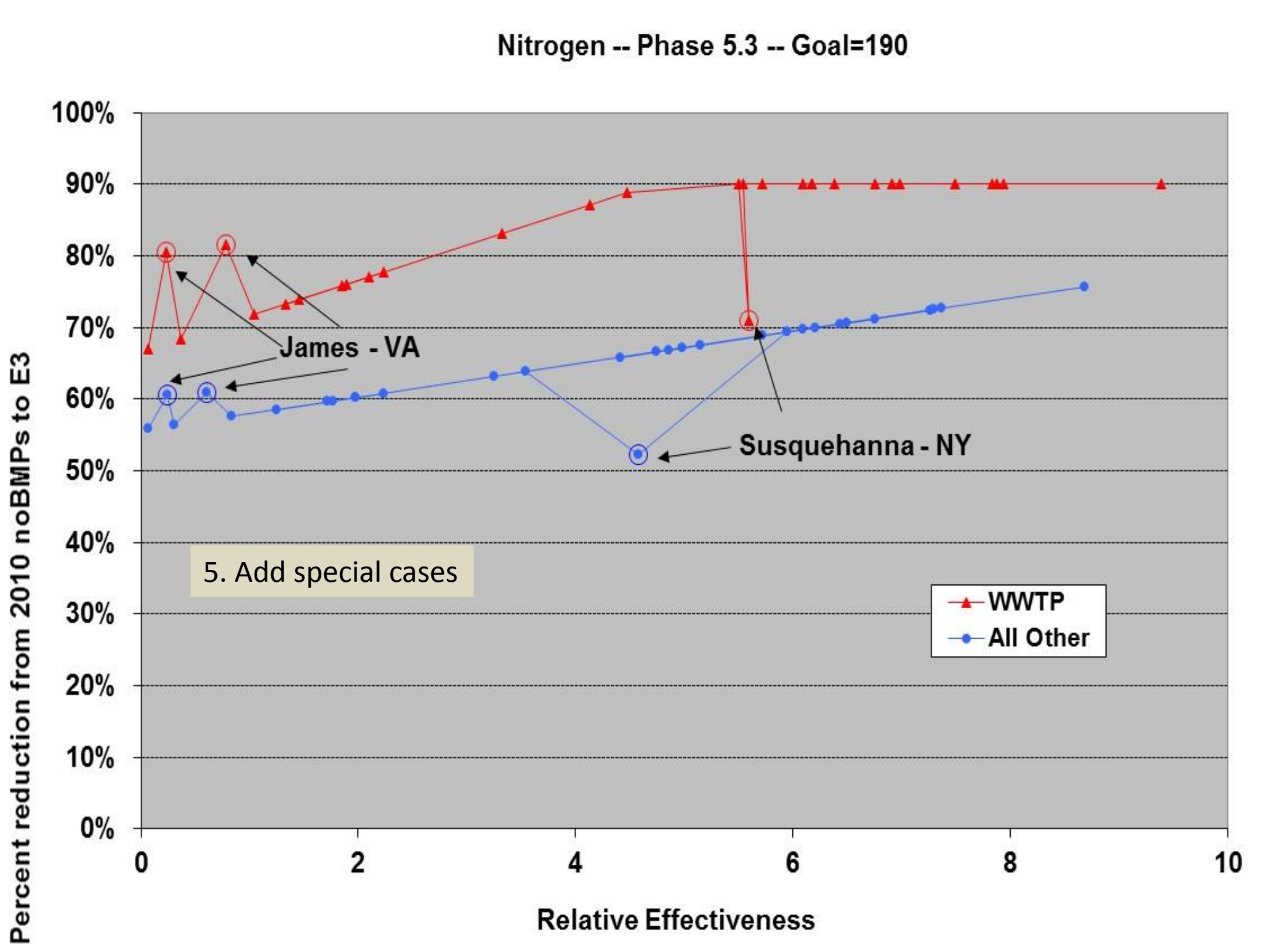
Guidelines for Planning Targets

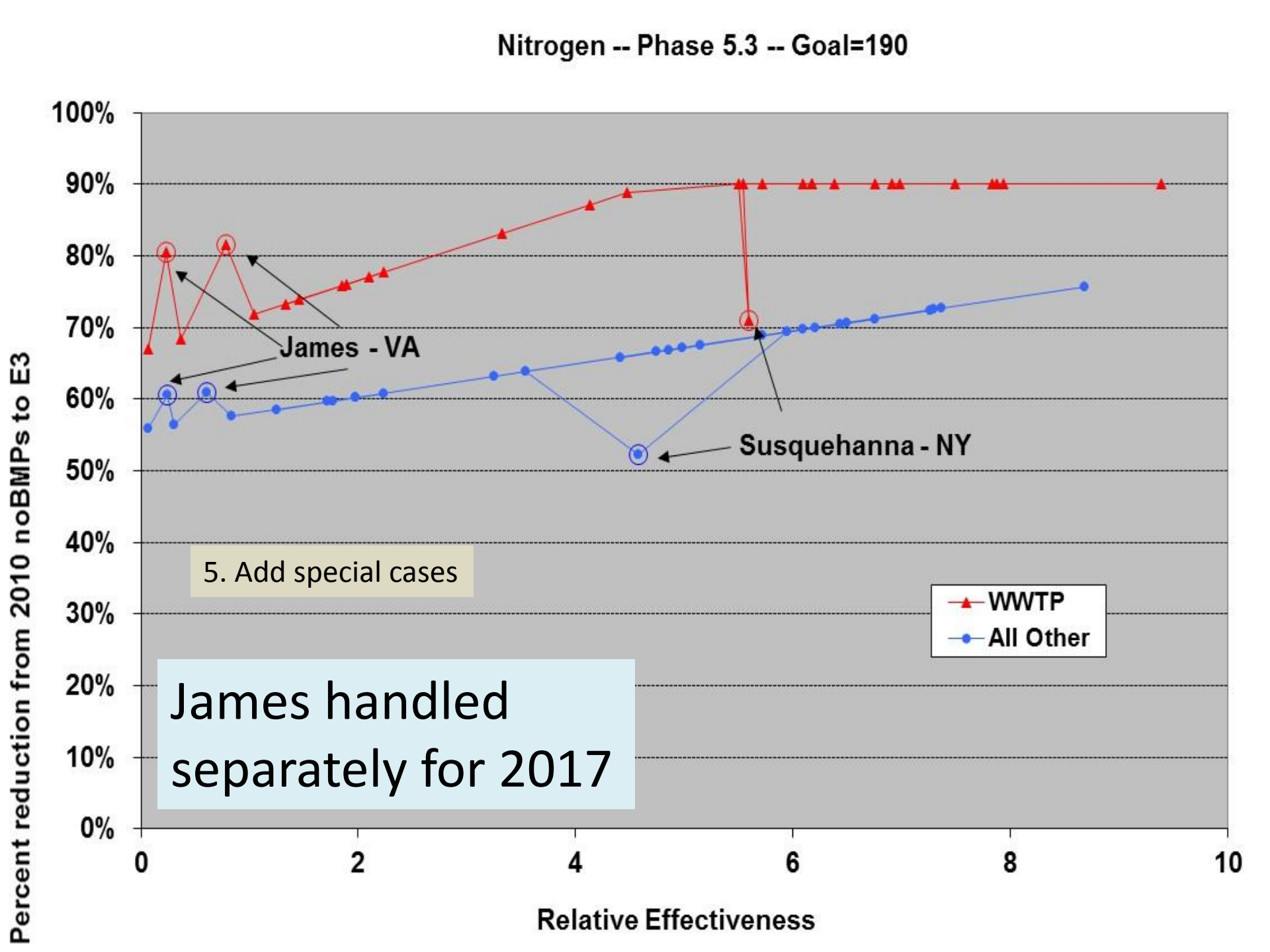
- Areas that contribute the most to the problem must do the most to resolve the problem.

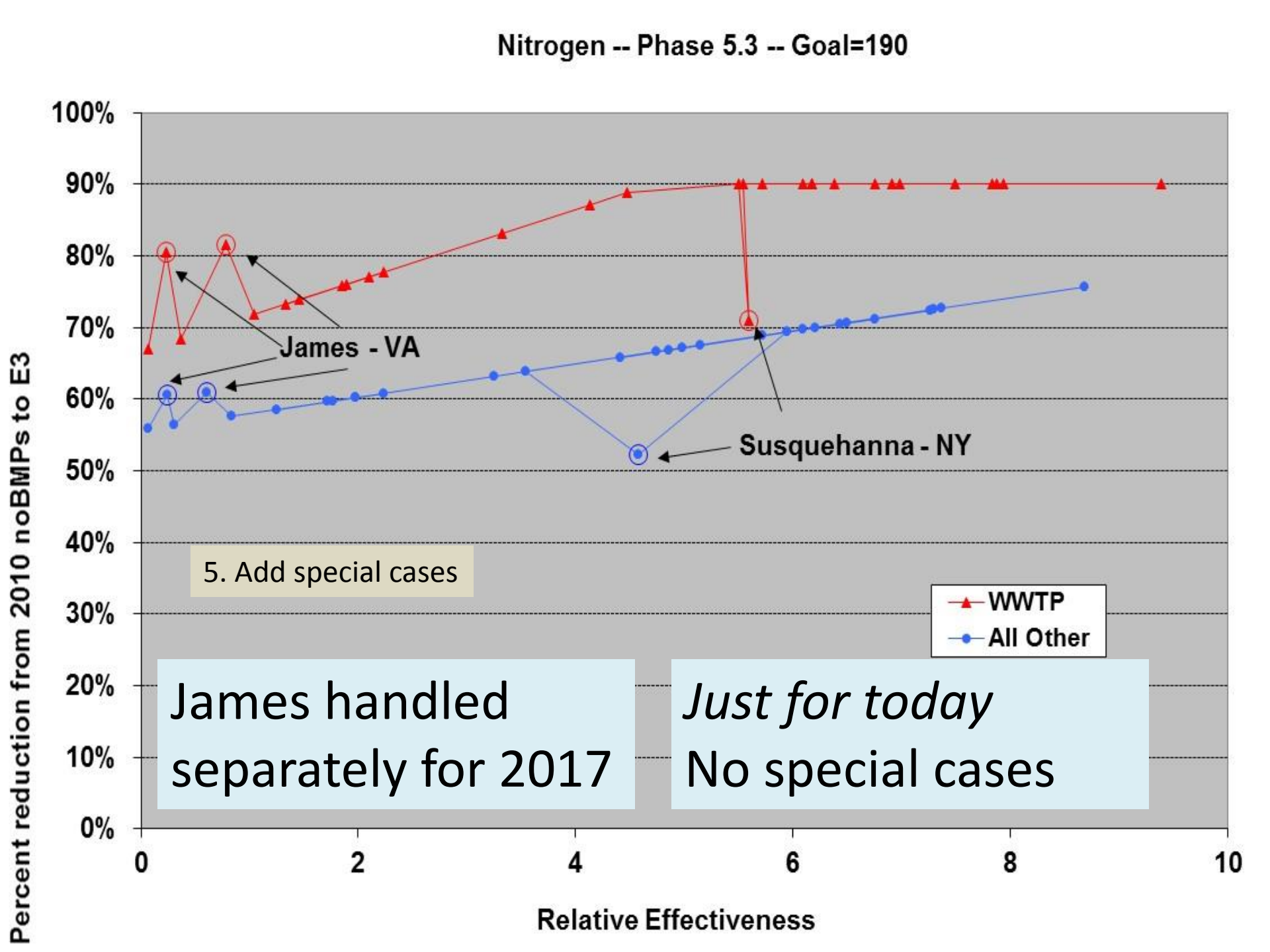



All Other
WWTP
TN, p5.3, goal=190, WWTP = 4.5-8 mg/l, other: max=min+20%
Percent reduction from 2010 noBMPs to E3
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
10
Relative Effectiveness
Wastewater Loads
4.5 mg/l
8 mg/l
½ of highest RE
All other sources
20 percent slope
2010 'hockey stick'


TP, p5.3, goal=12.67 WWTP = .22 - .54 mg/l, other: max=min+20%,
Percent reduction from 2010 noBMPs to E3
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
10
Relative Effectiveness
2010 'hockey stick'
1. Plot effectiveness vs percent effort
2. Use 2010 as the base year
3. Set upper half of WWTP line at .22 mg/l equivalent; intercept at .54 mg/l
4. Most effective basin is 20 percentage points higher than least effective
All Other
WWTP


Nitrogen -- Phase 5.3 -- Goal=190
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent reduction from 2010 noBMPs to E3
0
2
4
6
8
10
Relative Effectiveness
James - VA
Susquehanna - NY
5. Add special cases
WWTP
All Other


Nitrogen -- Phase 5.3 -- Goal=190
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent reduction from 2010 noBMPs to E3
0
2
4
6
8
10
Relative Effectiveness
James - VA
Susquehanna - NY
WWTP
All Other
5. Add special cases
James handled separately for 2017


Nitrogen -- Phase 5.3 -- Goal=190
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent reduction from 2010 noBMPs to E3
0
2
4
6
8
10
Relative Effectiveness
James - VA
Susquehanna - NY
WWTP
All Other
5. Add special cases
James handled separately for 2017
Just for today
No special cases

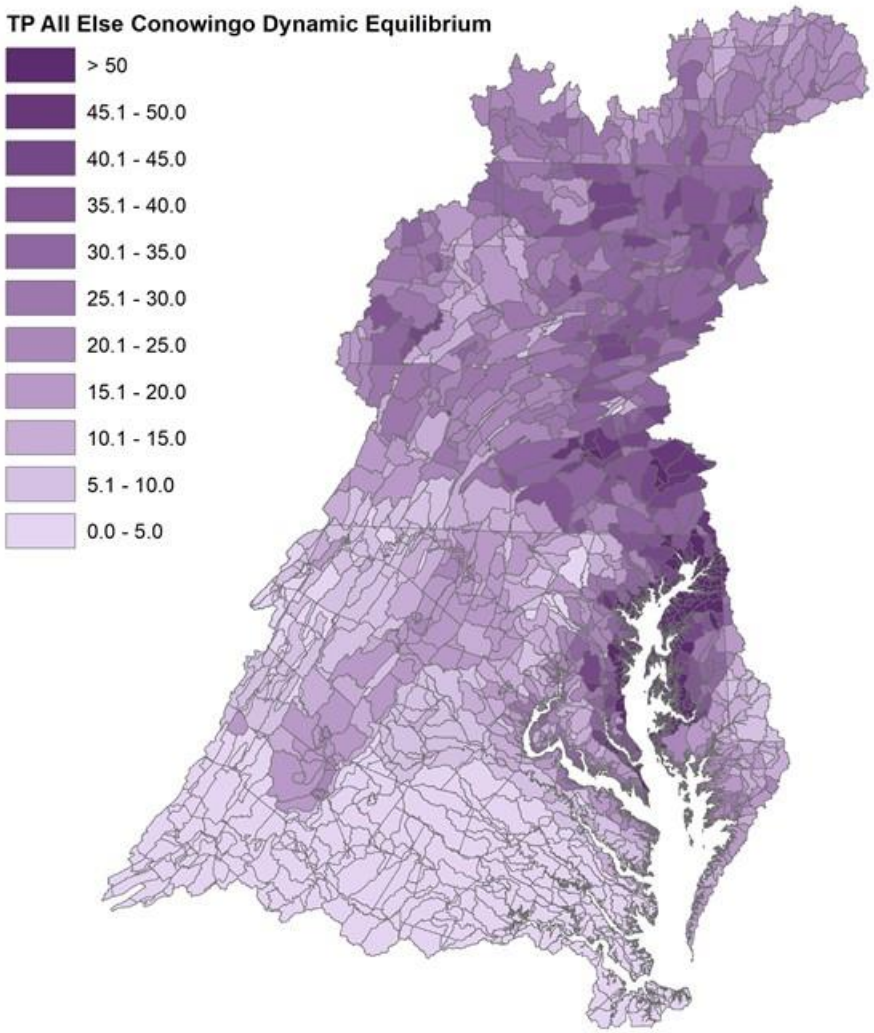
Determining Who Contributes the Most

Key factors:

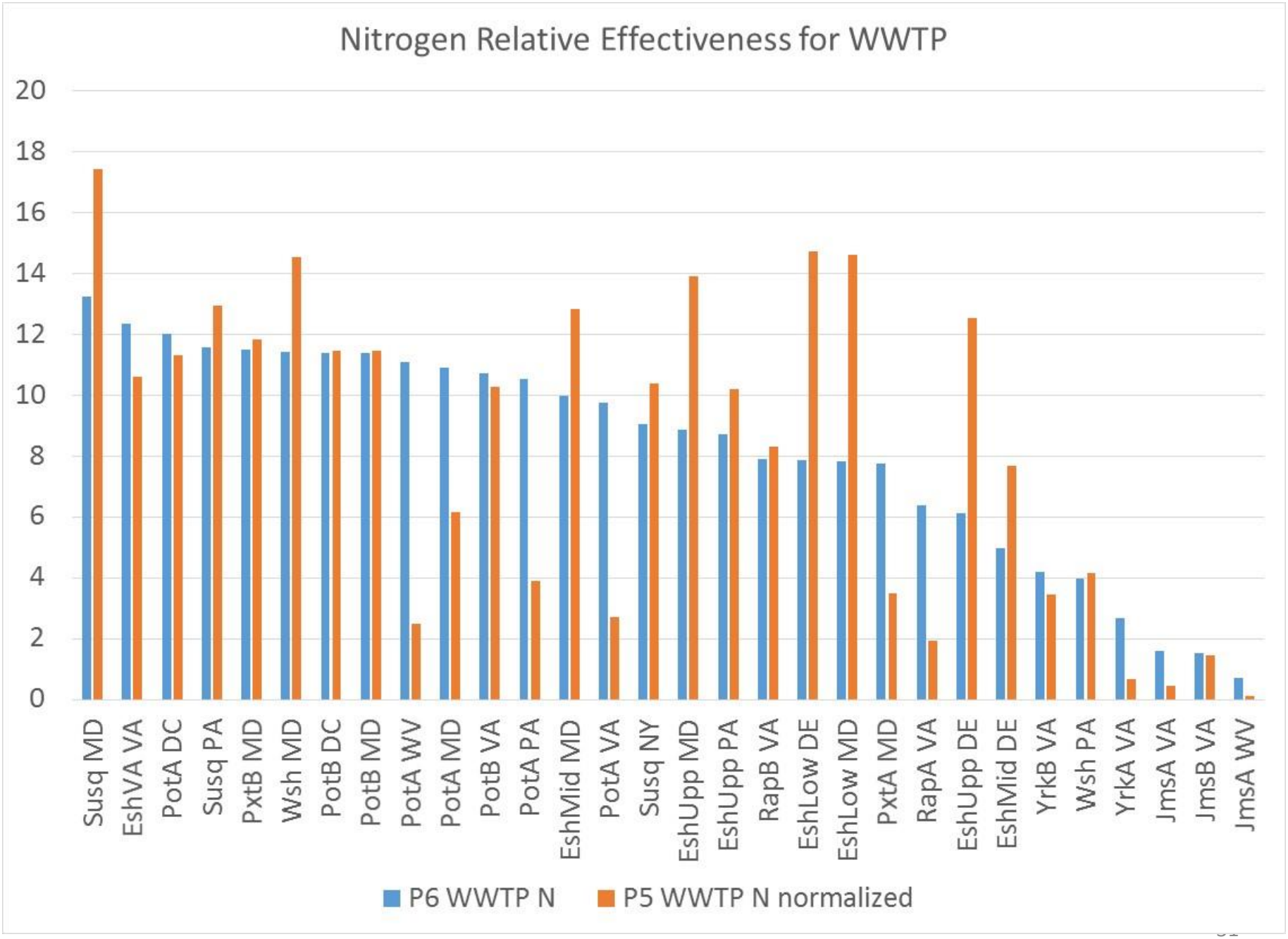
Watershed Transport
- Watershed Characteristics
- Travel time
- Existence of impoundments

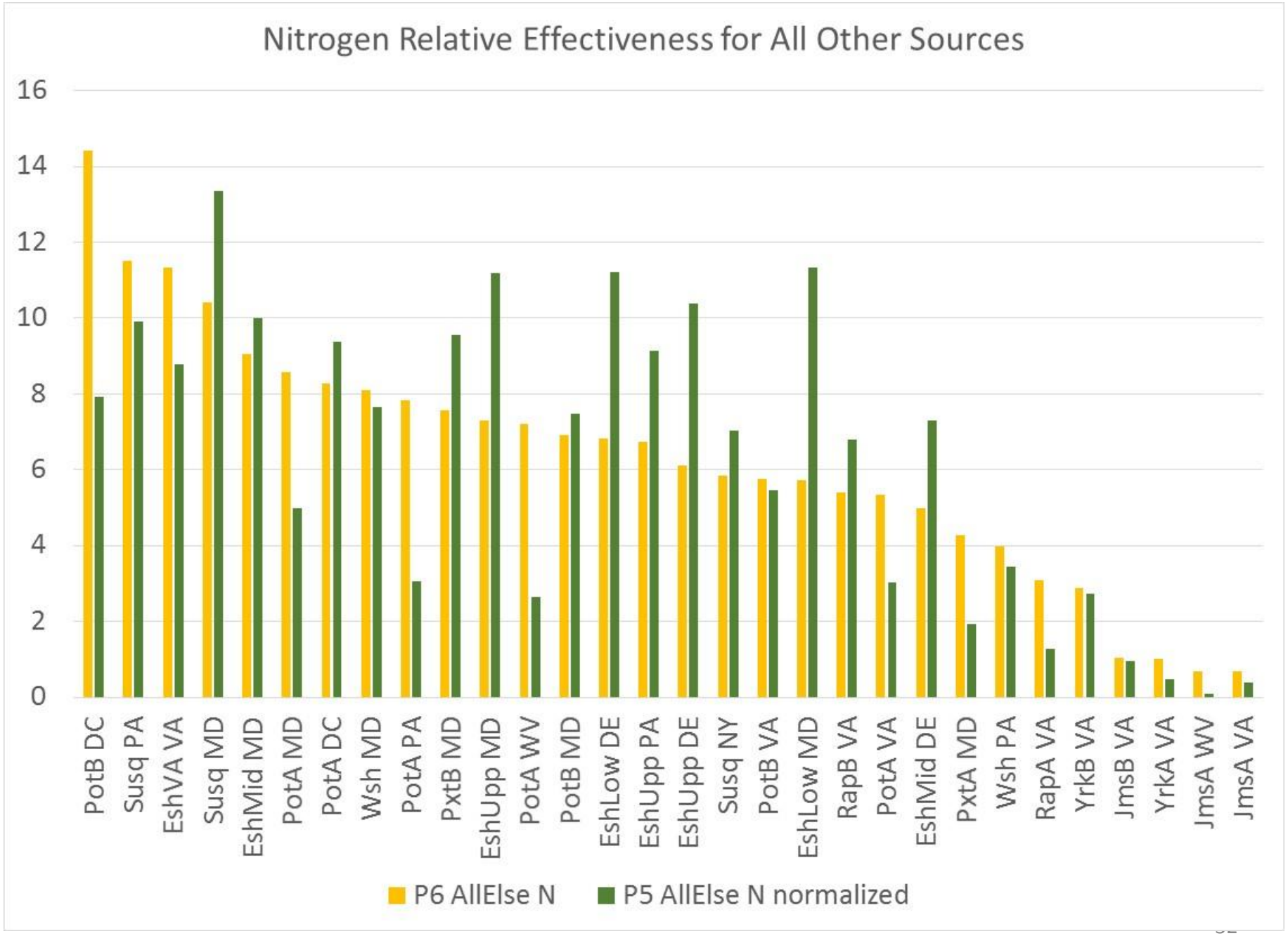
Position along mainstem bay
- Estuarine circulation

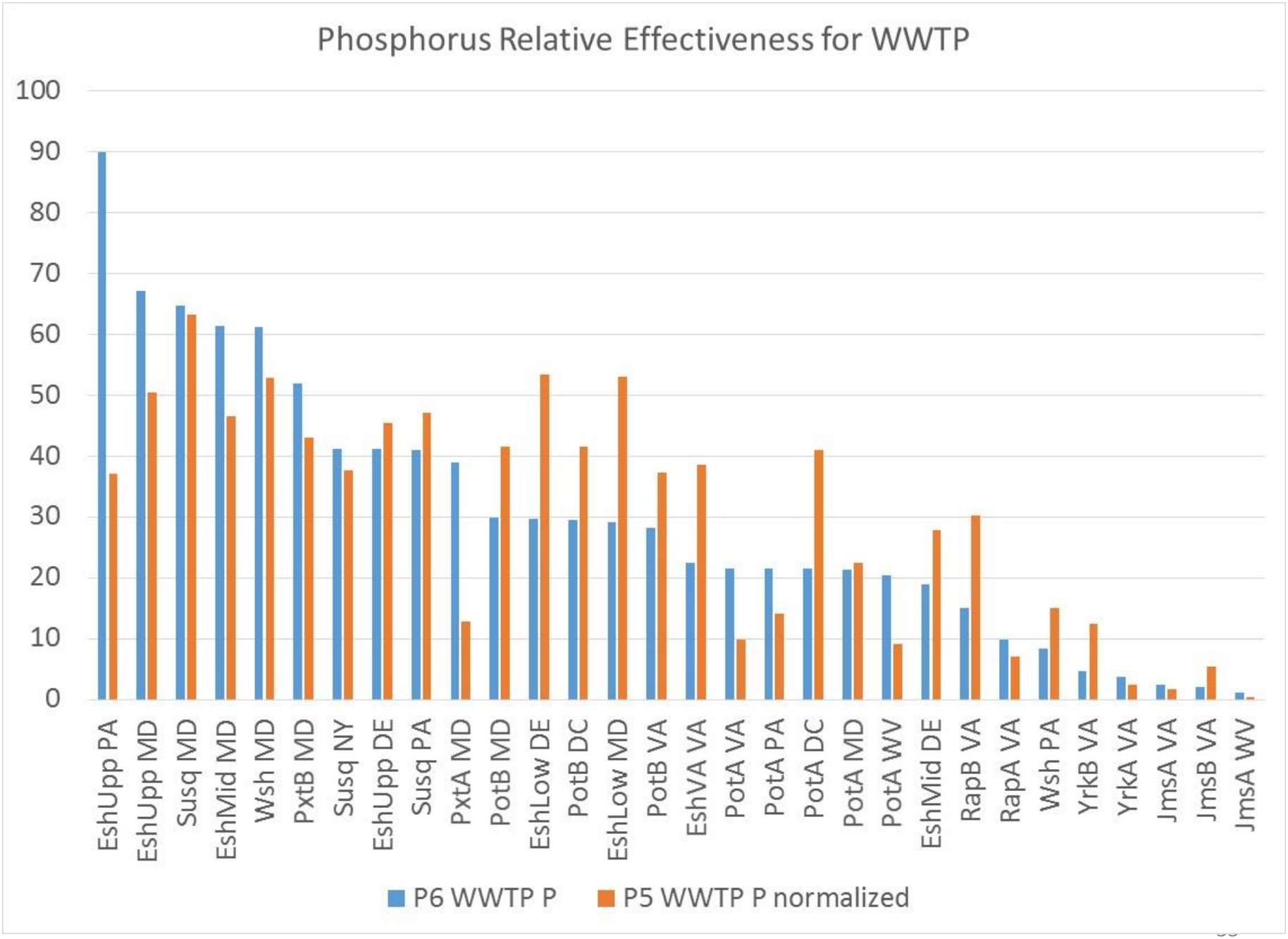
Existence of riverine estuary

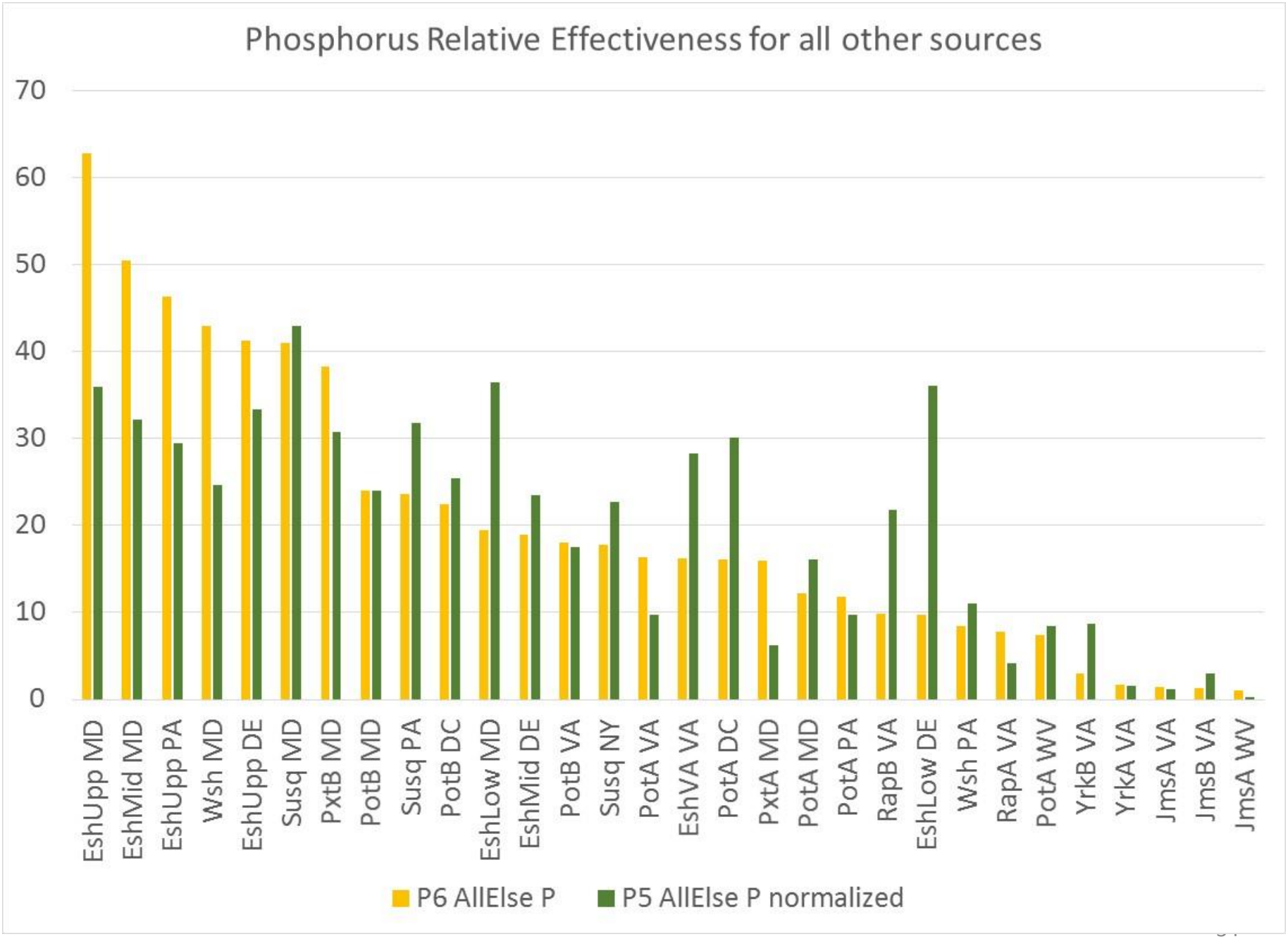


Watershed delivery:
Pound delivered per pound produced
Estuarine delivery
Oxygen reduced per pound delivered
Overall Effectiveness
Oxygen reduced per pound produced


Nitrogen Relative Effectiveness for WWTP
20
18
16
14
12
10
8
6
4
2
0
Susq MD
EshVA VA
PotA DC
Susq PA
PxtB MD
Wsh MD
PotB DC
PotB MD
PotA WV
PotA MD
PotB VA
PotA PA
EshMid MD
PotA VA
Susq NY
EshUpp MD
EshUpp PA
RapB VA
EshLow DE
EshLow MD
PxtA MD
RapA VA
EshUpp DE
EshMid DE
YrkB VA
Wsh PA
YrkA VA
JmsA VA
JmsB VA
JmsA WV
P6 WWTP N
P5 WWTP N normalized

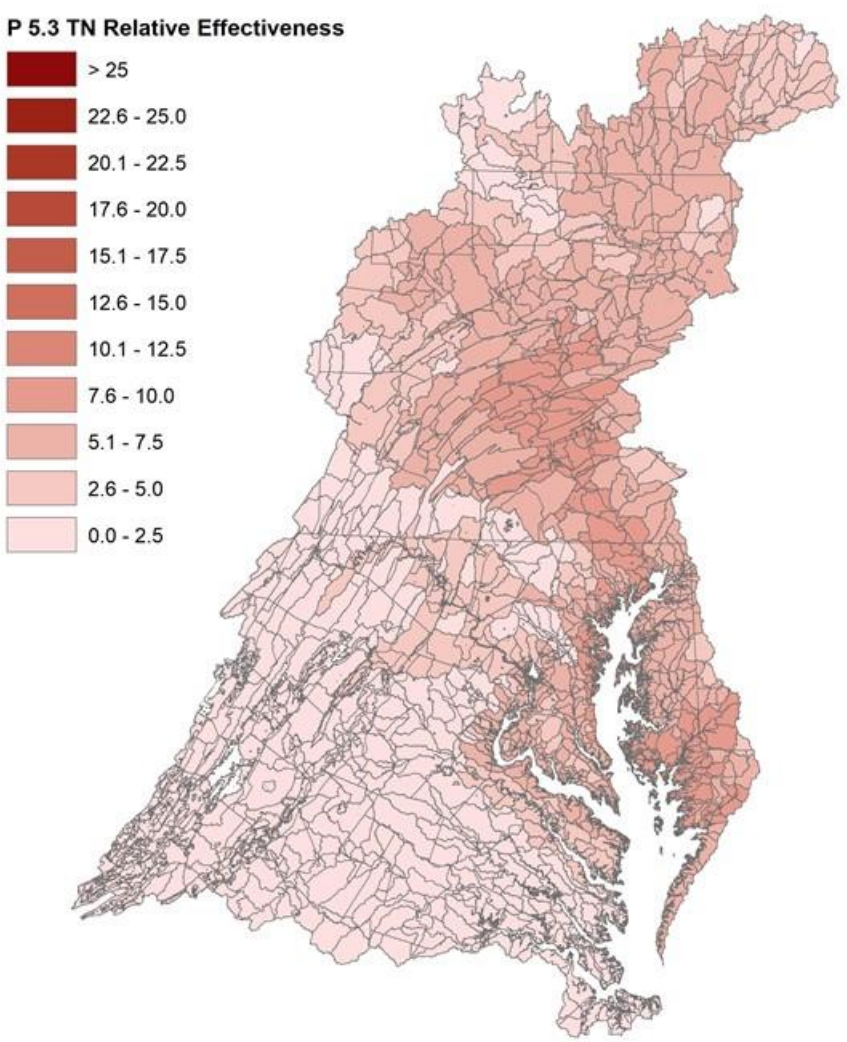

Nitrogen Relative Effectiveness for All Other Sources
16
14
12
10
8
6
4
2
0
PotB DC
Susq PA
EshVA VA
Susq MD
EshMid MD
PotA MD
PotA DC
Wsh MD
PotA PA
PxtB MD
EshUpp MD
PotA WV
PotB MD
EshLow DE
EshUpp PA
EshUpp DE
Susq NY
PotB VA
EshLow MD
RapB VA
PotA VA
EshMid DE
PxtA MD
Wsh PA
RapA VA
YrkB VA
JmsB VA
YrkA VA
JmsA WV
JmsA VA
P6 AllElse N
P5 AllElse N normalized


Phosphorus Relative Effectiveness for WWTP
100
90
80
70
60
50
40
30
20
10
0
EshUpp PA
EshUpp MD
Susq MD
EshMid MD
Wsh MD
PxtB MD
Susq NY
EshUpp DE
Susq PA
PxtA MD
PotB MD
EshLow DE
PotB DC
EshLow MD
PotB VA
EshVA VA
PotA VA
PotA PA
PotA DC
PotA MD
PotA WV
EshMid DE
RapB VA
RapA VA
Wsh PA
YrkB VA
YrkA VA
JmsA VA
JmsB VA
JmsA WV
P6 WWTP P
P5 WWTP P normalized

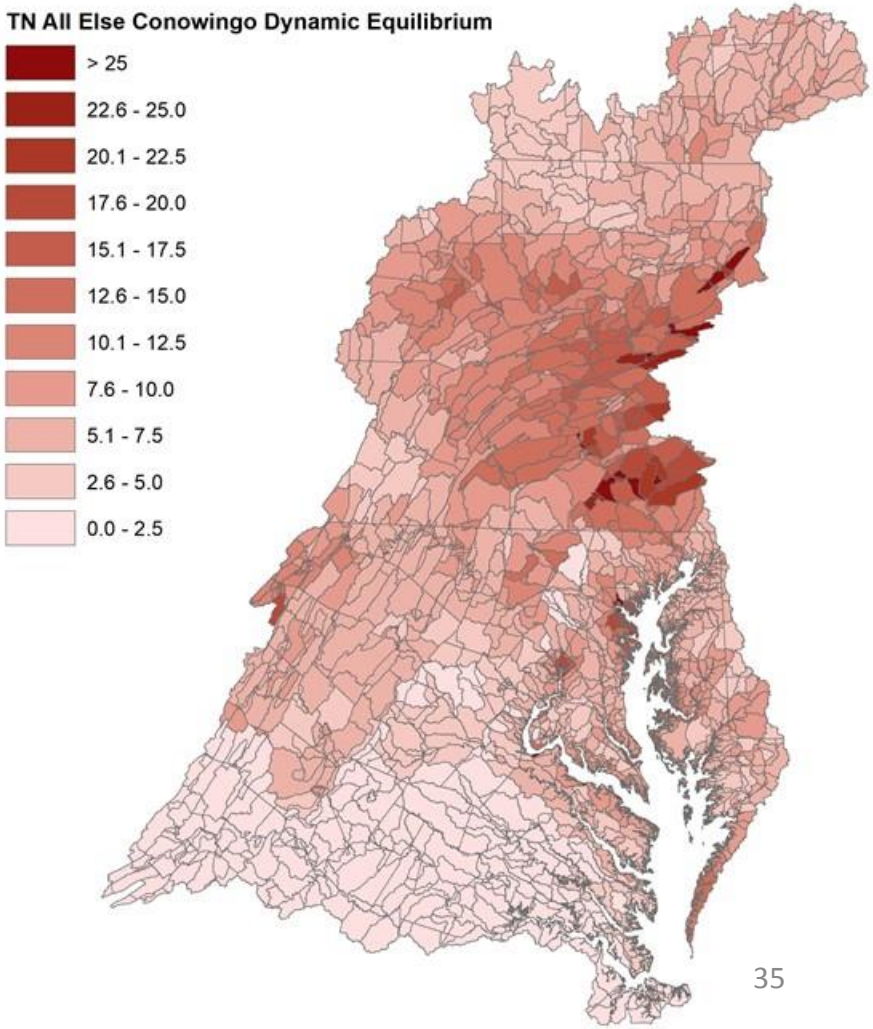

Phosphorus Relative Effectiveness for all other sources
70
60
50
40
30
20
10
0
EshUpp MD
EshMid MD
EshUpp PA
Wsh MD
EshUpp DE
Susq MD
PxtB MD
PotB MD
PotB MD
Susq PA
PotB DC
EshLow MD
EshMid DE
PotB VA
Susq NY
PotA VA
EshVA VA
PotA DC
PxtA MD
PotA MD
PotA PA
RapB VA
EshLow DE
Wsh PA
RapA VA
PotA WV
YrkB VA
YrkA VA
JmsA VA
JmsB VA
JmsA WV
P6 AllElse P
P5 AllElse P normalized

Nitrogen Relative Effectiveness

P5

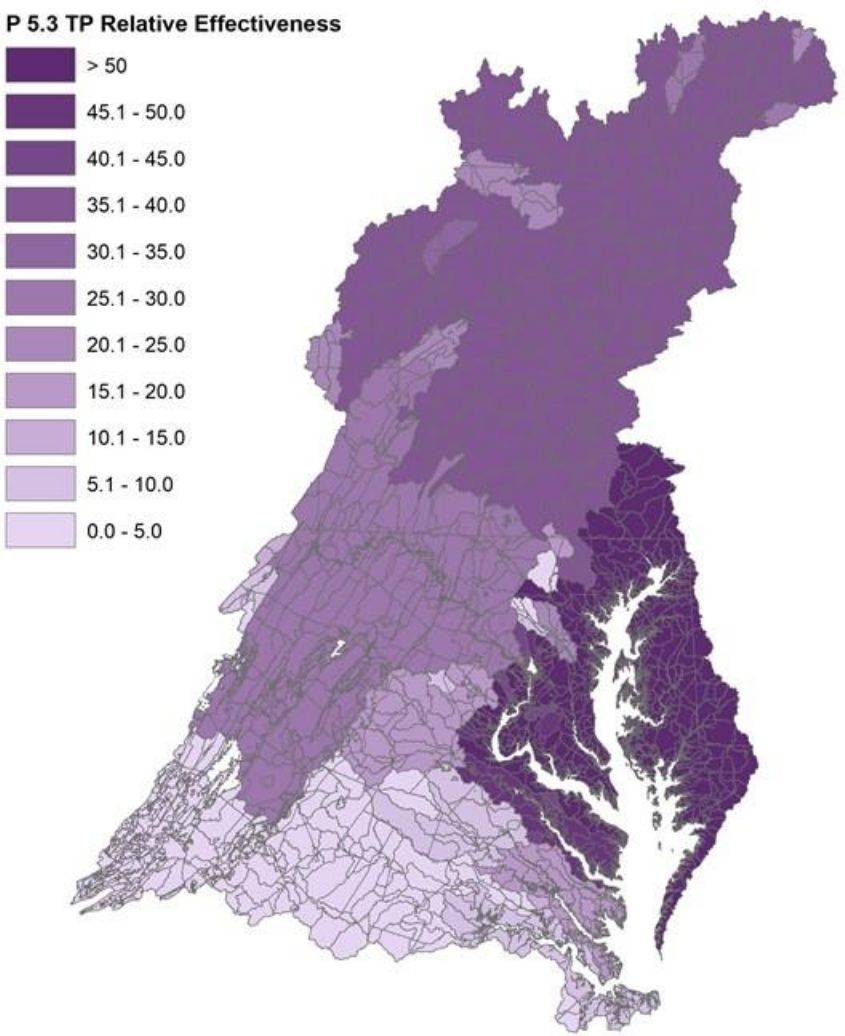


P6

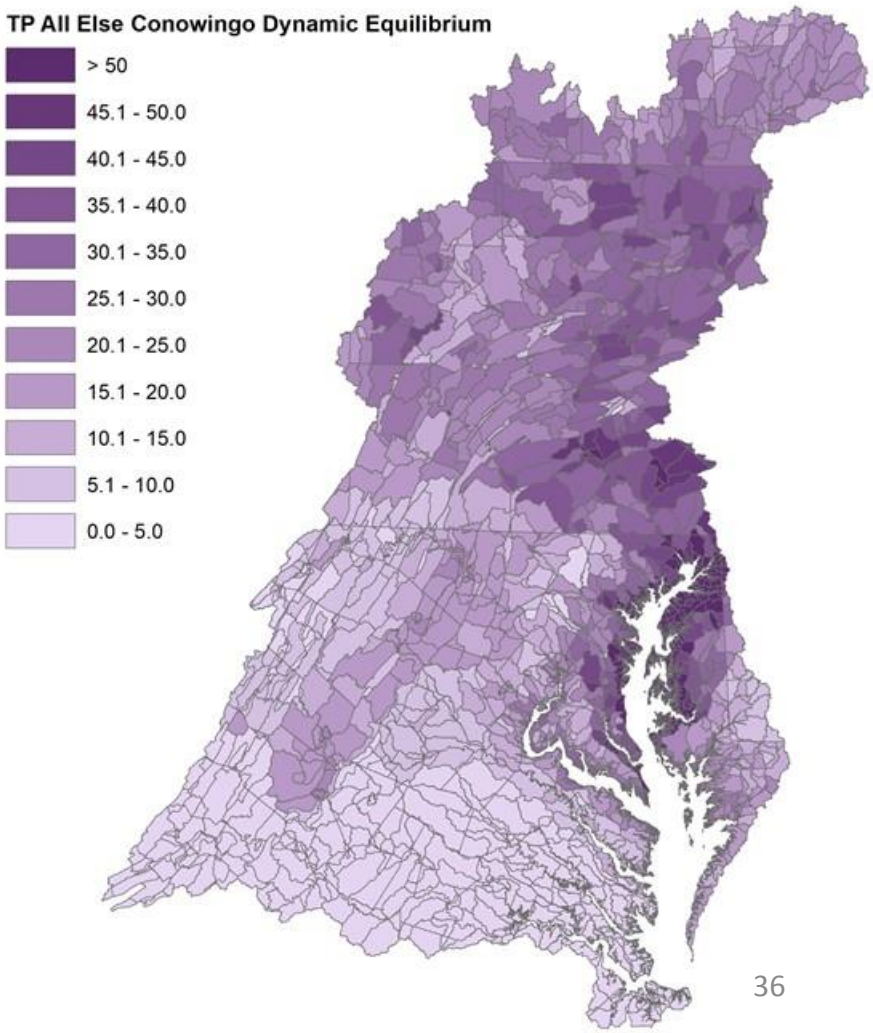


Phosphorus Relative Effectiveness

P5



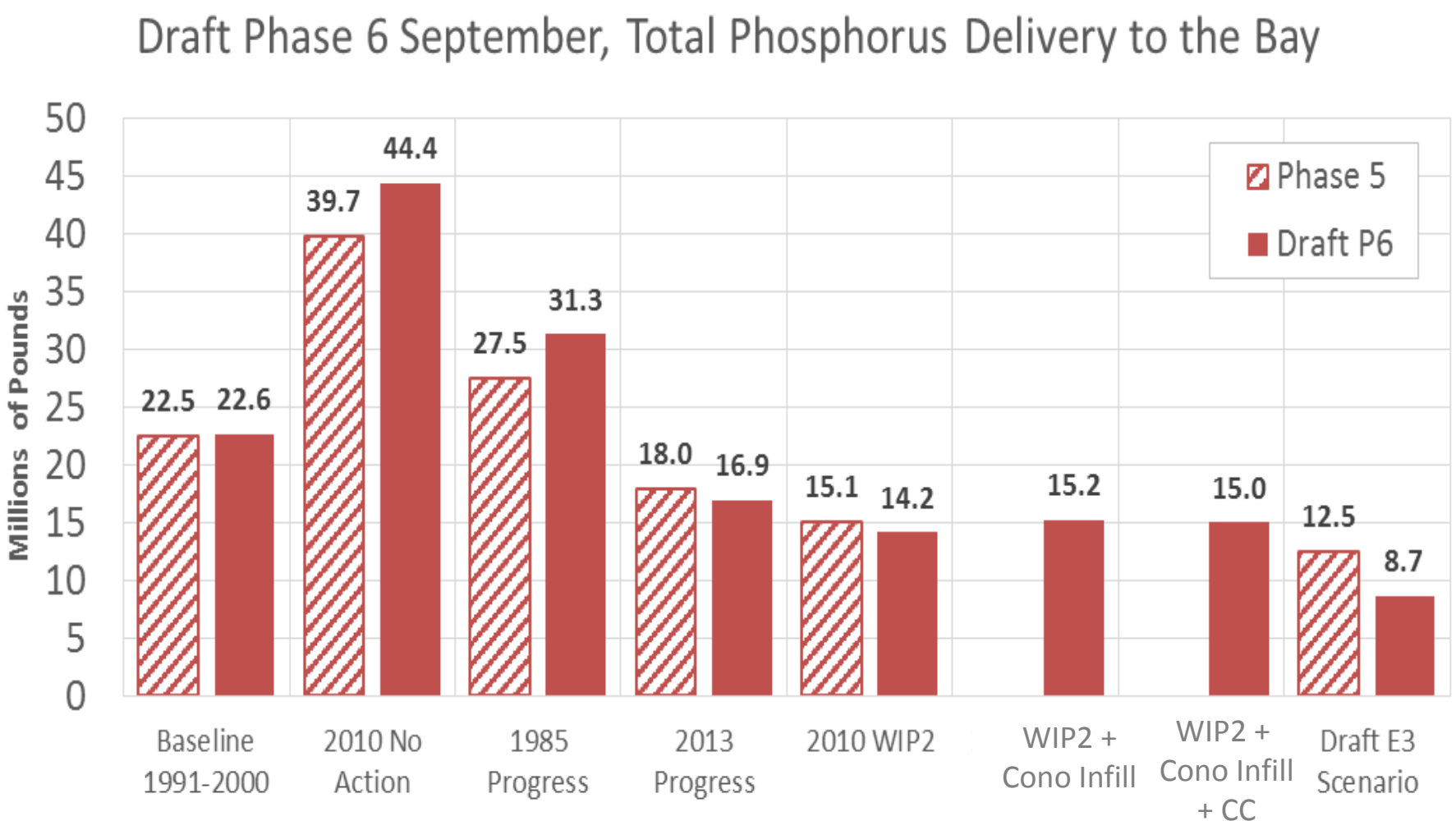
P6



New Phase 6 Model Results

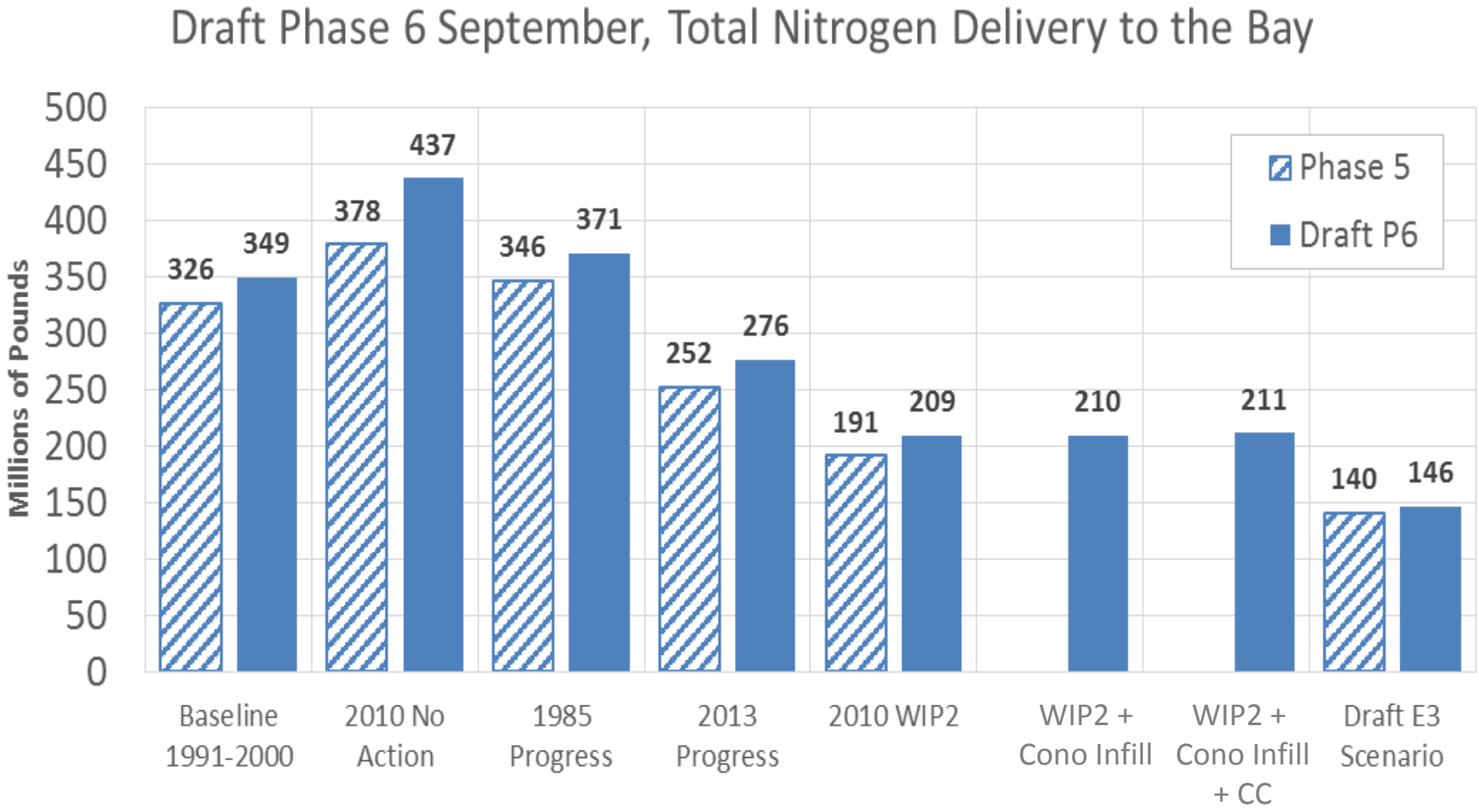
- Better inputs
- Better model
- Better calibration
- New No Action and E3
- Hydrodynamics
- Biogeochemistry
- Shoreline loads

Phase 6 Phosphorus Loads



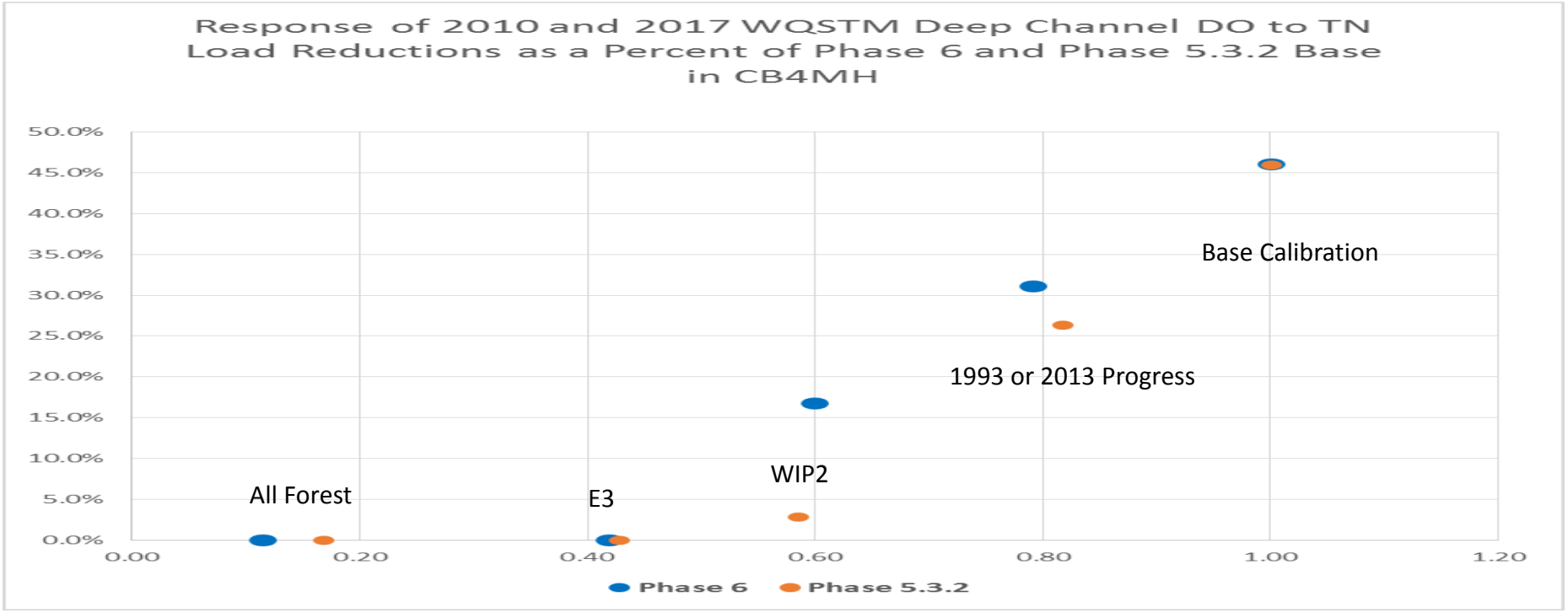
2017 September Draft Phase 6 in solid blue bars. Phase 5.3.2 in stippled bars. Units in millions of pounds.

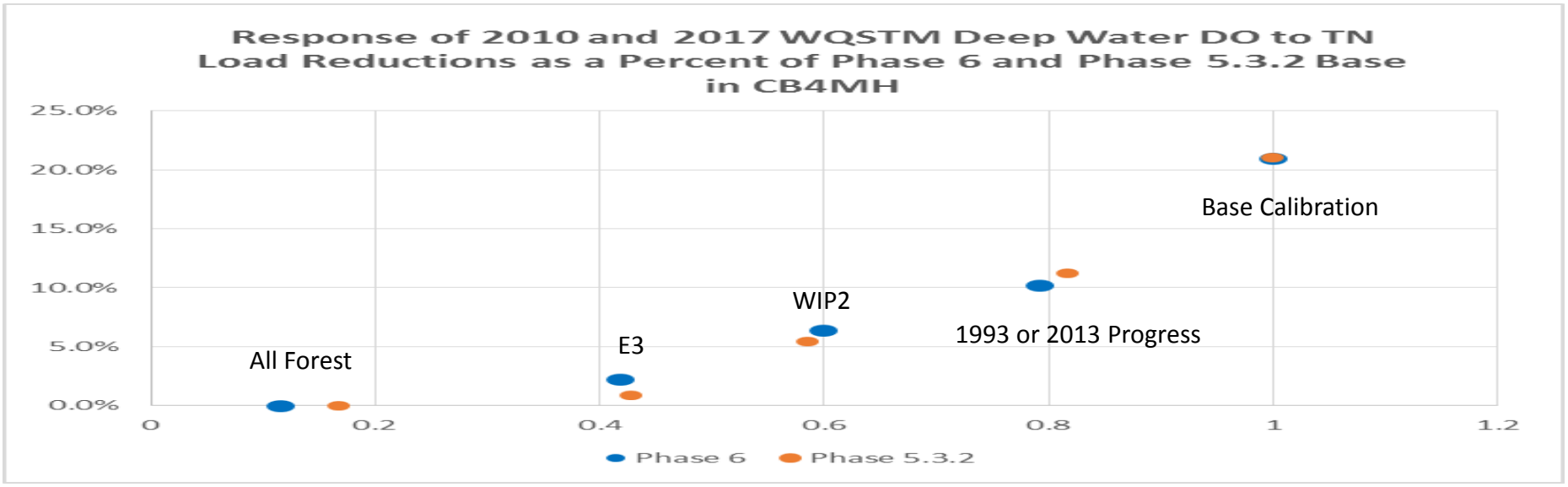
Phase 6 Nitrogen Loads



2017 September Draft Phase 6 in solid blue bars. Phase 5.3.2 in stippled bars. Units in millions of pounds.

The Degree of Water Quality Attainment In Deep Channel & Deep Water DO





The Phase 6 Assessment of Deep Channel DO Standard Achievement

		Base	No Action	1985 Progress	1993 Progress	2013 Progress	WIP2	WIP2 + Cono Infill	WIP2 + Cono + CC	E3	All Forest
Phase 6		349TN	437TN	371TN	279TN	276TN	209TN	210TN	211TN	146TN	40TN
9/25/17		22.6TP	44.4TP	31.3TP	17.9TP	16.9TP	14.2TP	15.2TP	15.0TP	8.7TP	2.1TP
		1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
Cbseg	State	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel
CB3MH	MD	16.0%	14.9%	10.6%	8.1%	1.6%	0.0%	0.6%	0.7%	0.0%	0.0%
CB4MH	MD	46.0%	56.1%	50.6%	47.2%	31.1%	16.8%	18.9%	19.4%	0.0%	0.0%
CB5MH	MD/VA	14.2%	21.8%	17.4%	15.6%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%
CHSMH	MD	37.4%	25.5%	19.8%	17.9%	9.3%	8.8%	11.5%	13.2%	0.6%	0.0%
POTMH	MD/VA	20.2%	23.9%	19.4%	17.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
POMMH	MD	20.4%	24.0%	19.5%	17.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
RPPMH	VA	19.0%	27.9%	18.3%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EASMH	MD	25.4%	34.4%	23.1%	19.5%	13.4%	9.8%	14.5%	14.6%	1.1%	0.0%
MD5MH	MD	21.7%	29.2%	24.4%	22.4%	6.8%	0.0%	0.0%	0.1%	0.0%	0.0%
VA5MH	VA	4.5%	11.9%	7.9%	6.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PATMH	MD	24.8%	44.2%	41.2%	28.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

		Base	No Action	1985 Progress	2009 Progress	WIP2	E3	All Forest
Phase 5.3.2		323TN	376TN	344TN	264TN	189TN	138TN	54TN
		20.6TP	37.9TP	25.7TP	18.3TP	13.2TP	10.6TP	2.6TP
		1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
Cbseg	State	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel
CB3MH	MD	16.0%	22.0%	19.2%	7.3%	0.2%	0.0%	0.0%
CB4MH	MD	46.0%	52.8%	49.1%	26.4%	2.9%	0.0%	0.0%
CB5MH	MD/VA	14.2%	20.0%	37.4%	0.6%	0.0%	2.3%	0.0%
CHSMH	MD	37.4%	41.5%	22.7%	35.6%	16.6%	0.6%	0.0%
POTMH	MD/VA	20.2%	27.4%	22.7%	0.0%	0.0%	0.0%	0.0%
POMMH	MD	20.4%	27.6%	22.8%	0.0%	0.0%	0.0%	0.0%
RPPMH	VA	19.0%	28.1%	25.1%	0.0%	0.0%	0.0%	0.0%
EASMH	MD	25.4%	35.6%	27.5%	14.0%	1.6%	1.1%	0.0%
MD5MH	MD	21.7%	27.2%	23.8%	3.9%	0.0%	0.0%	0.0%
VA5MH	VA	4.5%	10.7%	7.4%	0.0%	0.0%	0.0%	0.0%
PATMH	MD	24.8%	49.1%	38.2%	11.5%	0.0%	0.0%	0.0%

The Phase 6 Assessment of Deep Channel DO Standard Achievement

Phase 6

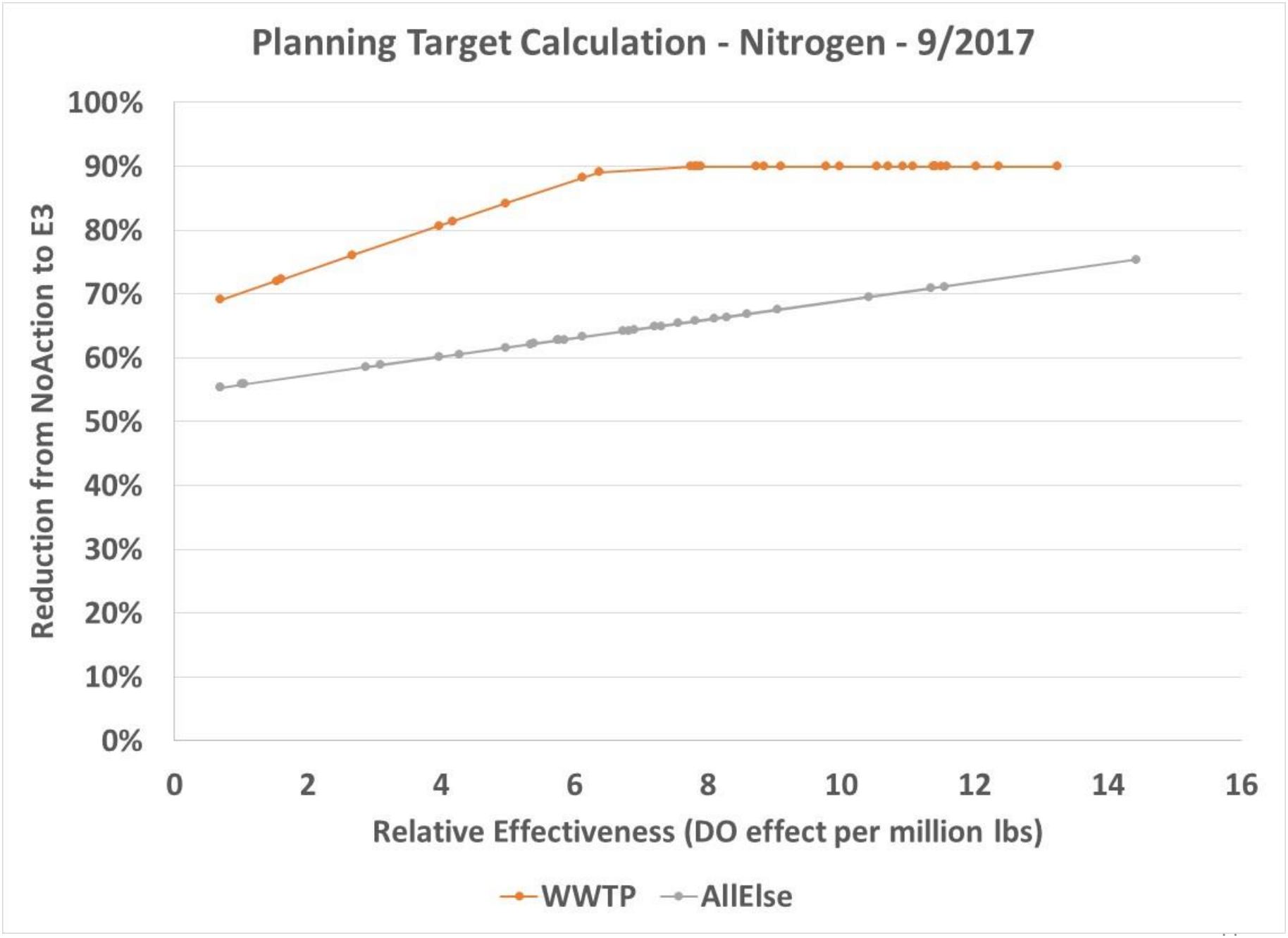
Phase 6 9/25/17		WIP2 209TN 14.2TP	WIP2 + Cono Infill 210TN 15.2TP	WIP2 + Cono + CC 211TN 15.0TP	E3 146TN 8.7TP
Cbseg	State	1993-1995 Deep Channel	1993-1995 Deep Channel	1993-1995 Deep Channel	1993-1995 Deep Chann
CB3MH	MD	0.0%	0.6%	0.7%	0.0%
CB4MH	MD	16.8%	18.9%	19.4%	0.0%
CB5MH	MD/VA	0.0%	0.0%	0.0%	0.0%
CHSMH	MD	8.8%	11.5%	13.2%	0.6%
POTMH	MD/VA	0.0%	0.0%	0.0%	0.0%
POMMH	MD	0.0%	0.0%	0.0%	0.0%
RPPMH	VA	0.0%	0.0%	0.0%	0.0%
EASMH	MD	9.8%	14.5%	14.6%	1.1%
MD5MH	MD	0.0%	0.0%	0.1%	0.0%
VA5MH	VA	0.0%	0.0%	0.0%	0.0%
PATMH	MD	0.0%	0.0%	0.0%	0.0%

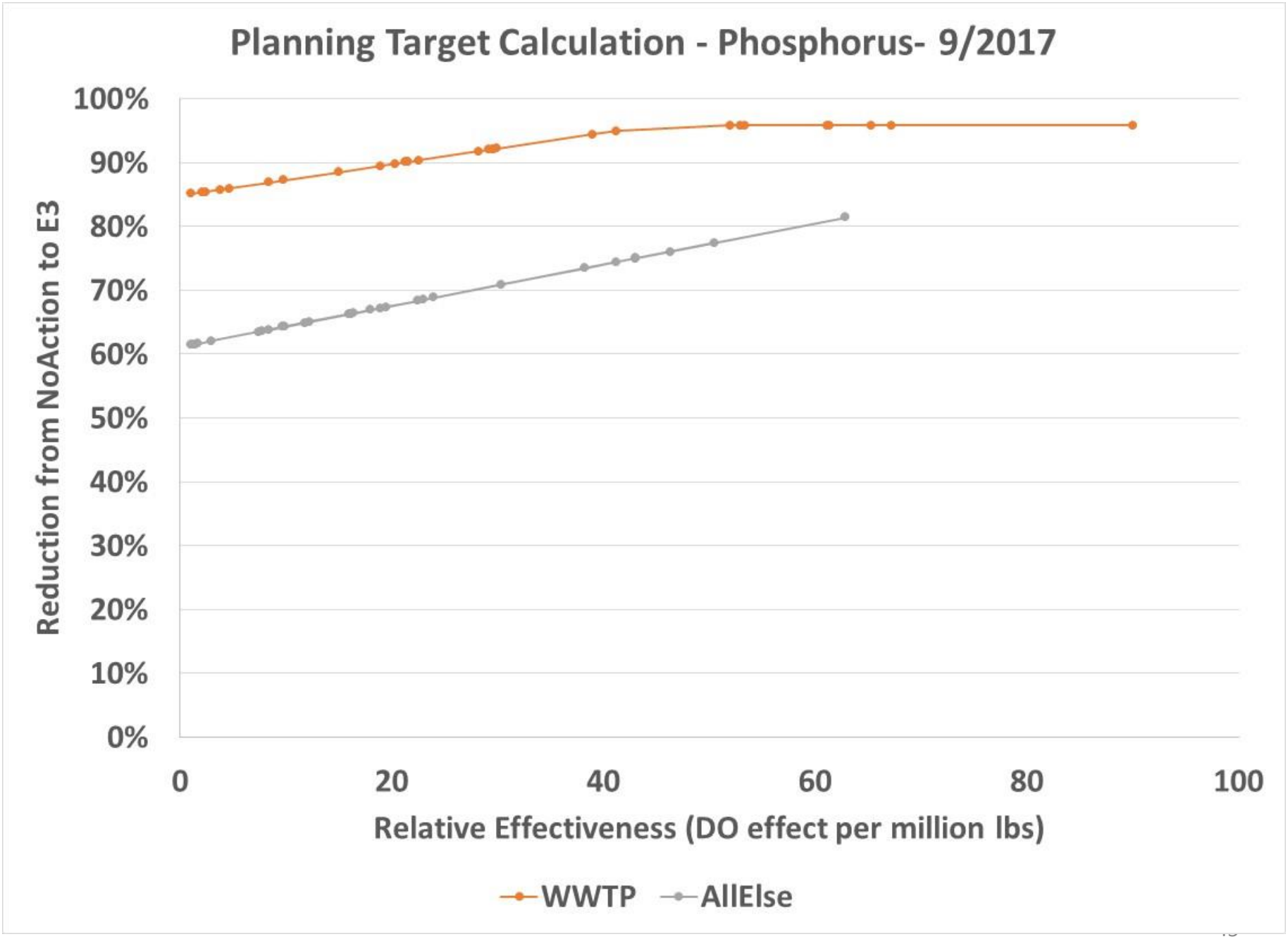
Phase 5

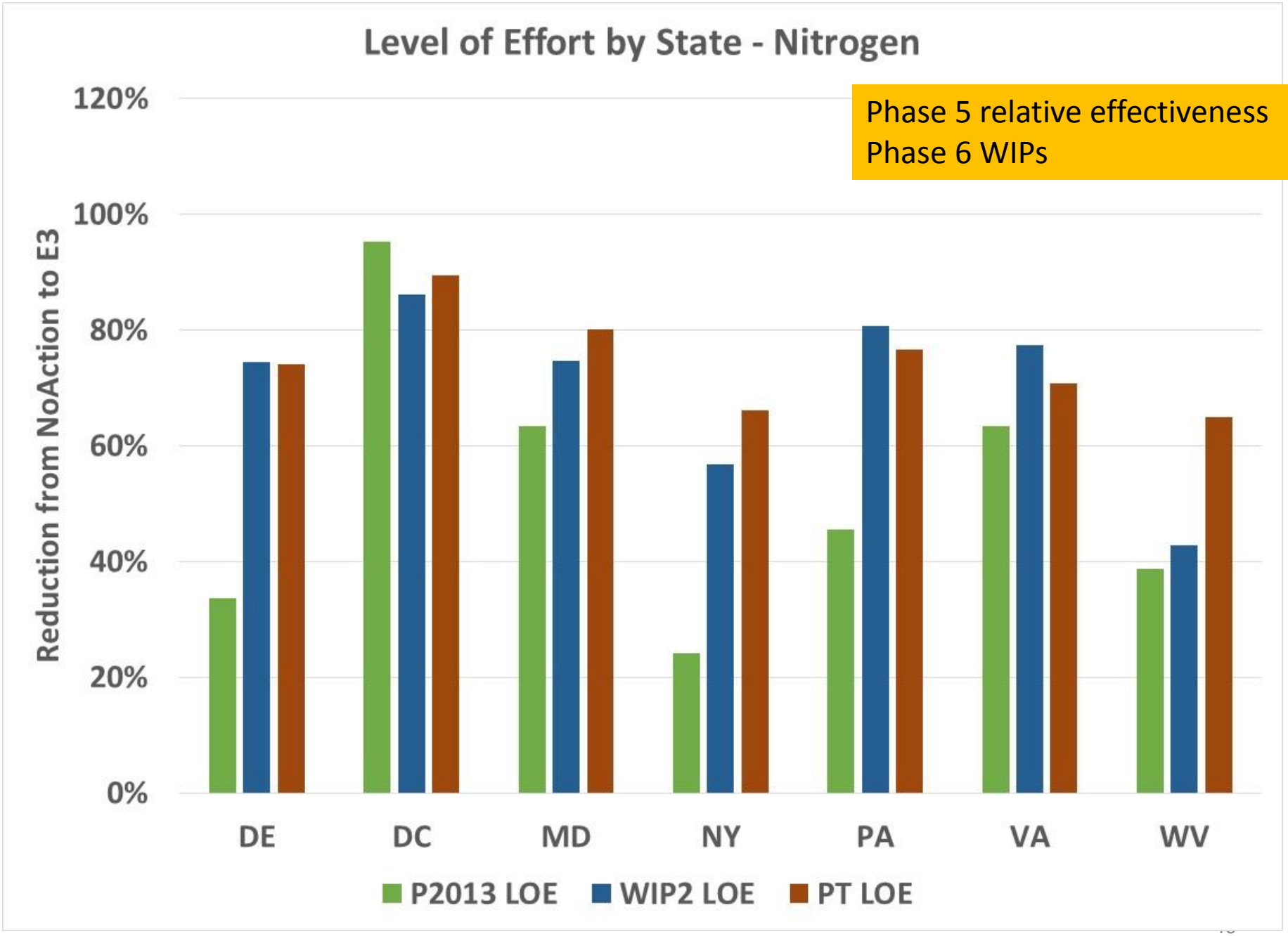
WIP2 189TN 13.2TP	E3 138TN 10.6TP
1993-1995 Deep Channel	1993-1995 Deep Channel
0.2%	0.0%
2.9%	0.0%
0.0%	2.3%
16.6%	0.6%
0.0%	0.0%
0.0%	0.0%
0.0%	0.0%
1.6%	1.1%
0.0%	0.0%
0.0%	0.0%
0.0%	0.0%

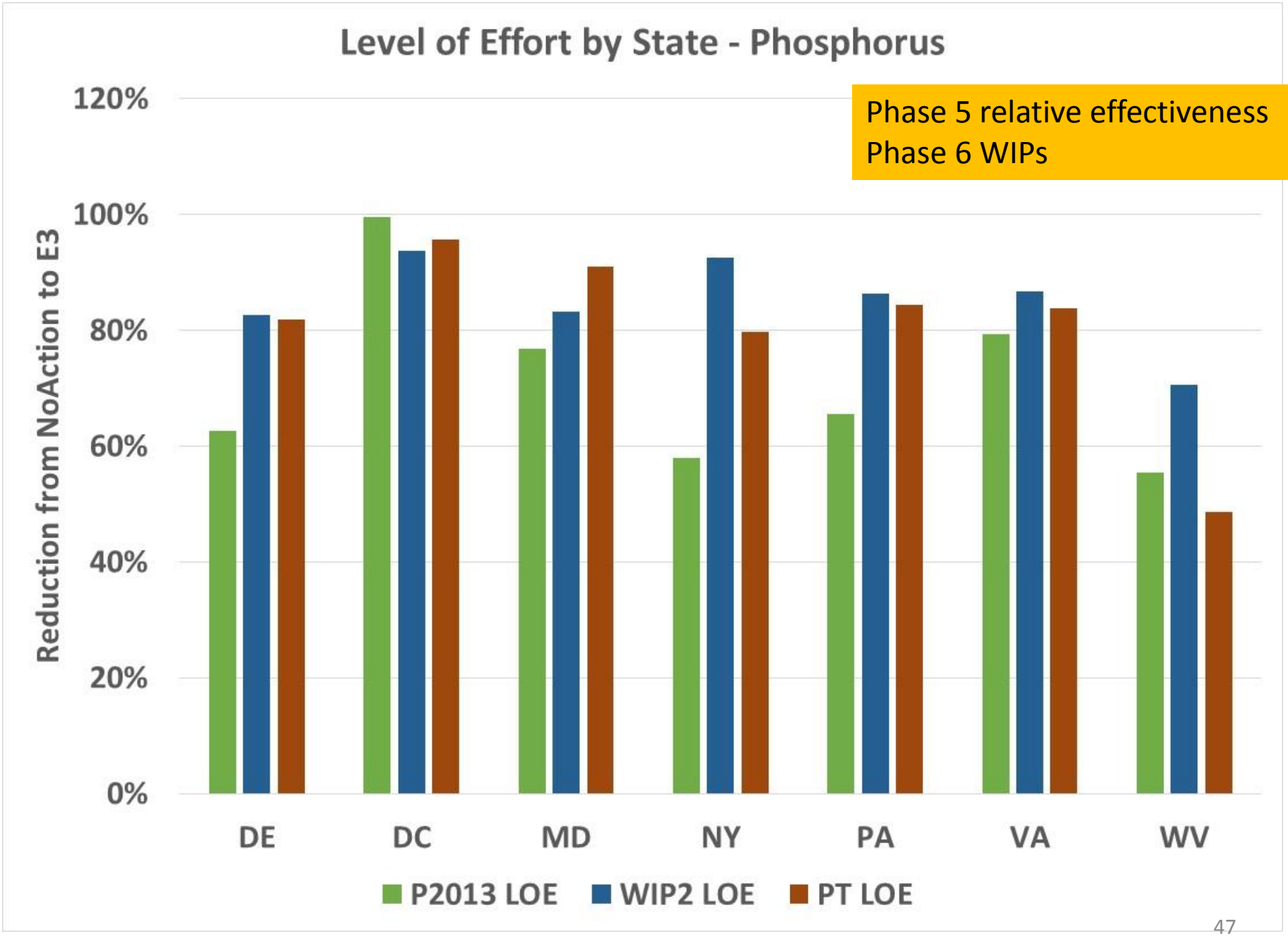
Planning Target Calculation

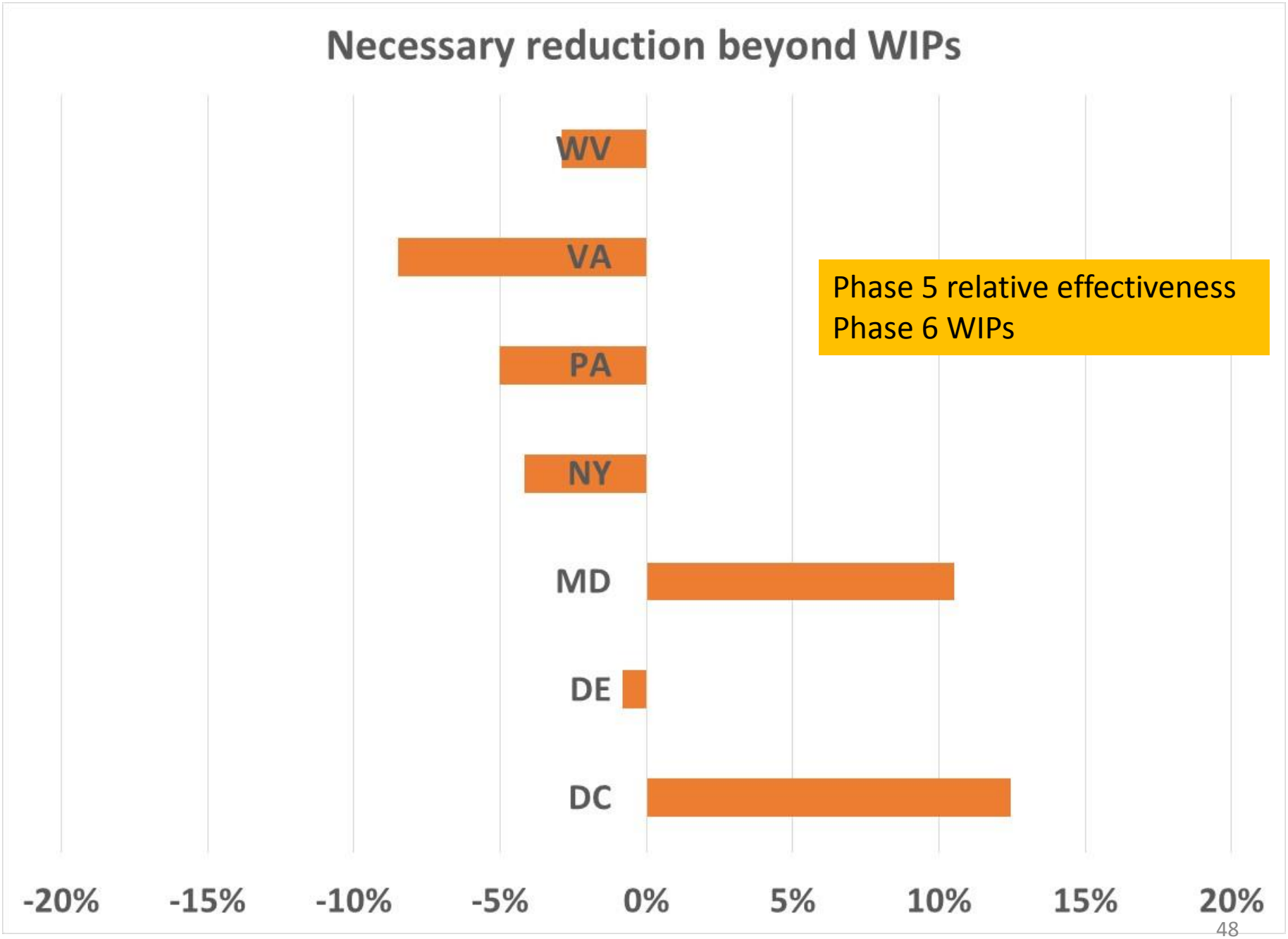
- Assumed the assimilative capacity was the WIP2 with the mid-1990s Conowingo
- Incrementally look at the effects of
  - Model changes
  - Planning Target Method changes


Planning Target Calculation - Nitrogen - 9/2017
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Reduction from NoAction to E3
0
2
4
6
8
10
12
14
16
Relative Effectiveness (DO effect per million lbs)
WWTP
AllElse


Planning Target Calculation - Phosphorus- 9/2017
Reduction from NoAction to E3
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
20
40
60
80
100
Relative Effectiveness (DO effect per million lbs)
WWTP
AllElse


Level of Effort by State - Nitrogen
Phase 5 relative effectiveness
Phase 6 WIPs
Reduction from NoAction to E3
120%
100%
80%
60%
40%
20%
0%
DE
DC
MD
NY
PA
VA
WV
P2013 LOE
WIP2 LOE
PT LOE


Level of Effort by State - Phosphorus
Phase 5 relative effectiveness
Phase 6 WIPs
Reduction from NoAction to E3
120%
100%
80%
60%
40%
20%
0%
DE
DC
MD
NY
PA
VA
WV
P2013 LOE
WIP2 LOE
PT LOE


Necessary reduction beyond WIPs
WV
VA
PA
NY
MD
DE
DC
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%
Phase 5 relative effectiveness
Phase 6 WIPs

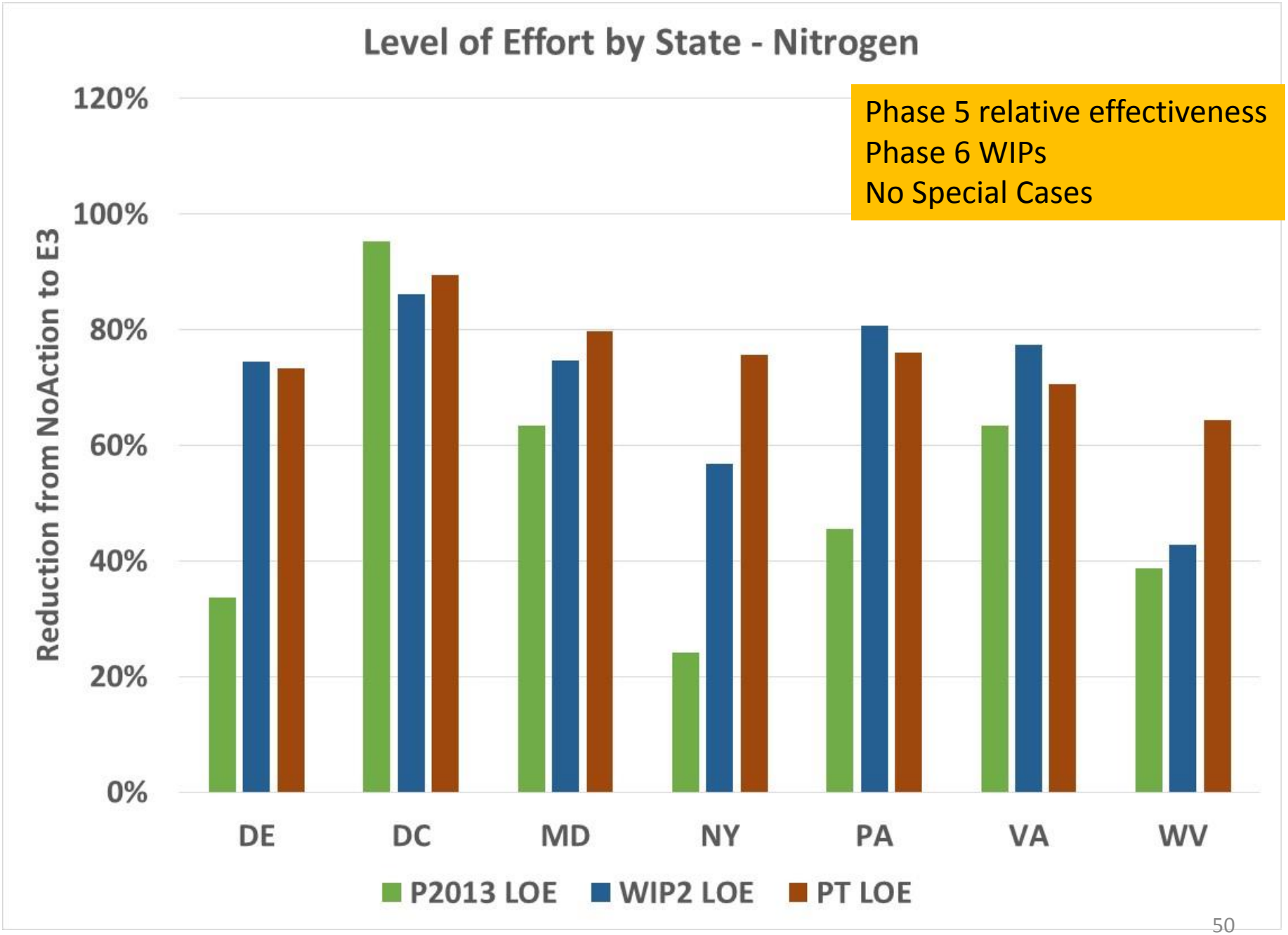
What Changed?

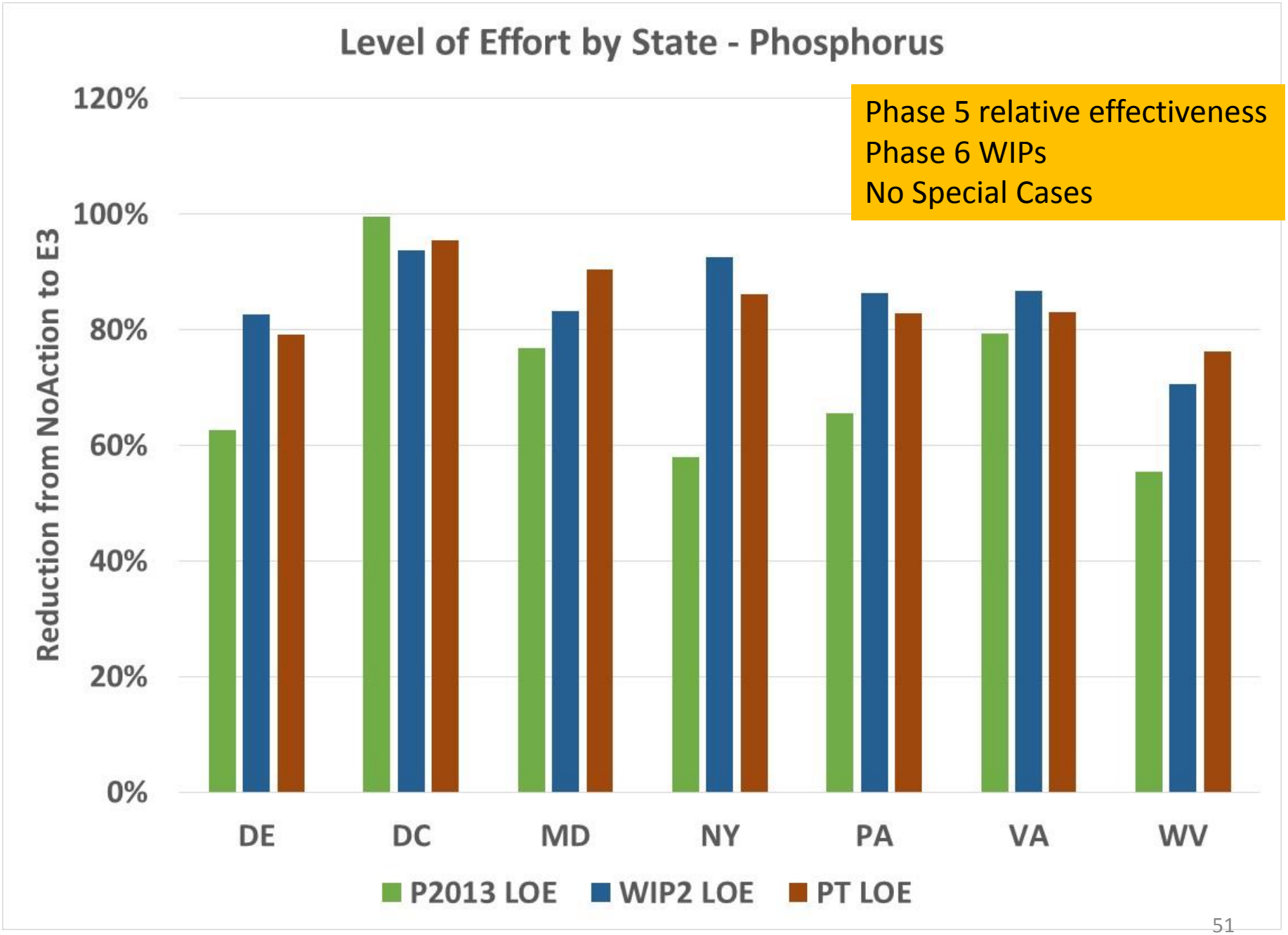
- Number of BMPs
- Effectiveness of BMPs
- Land loading rates
- Watershed delivery

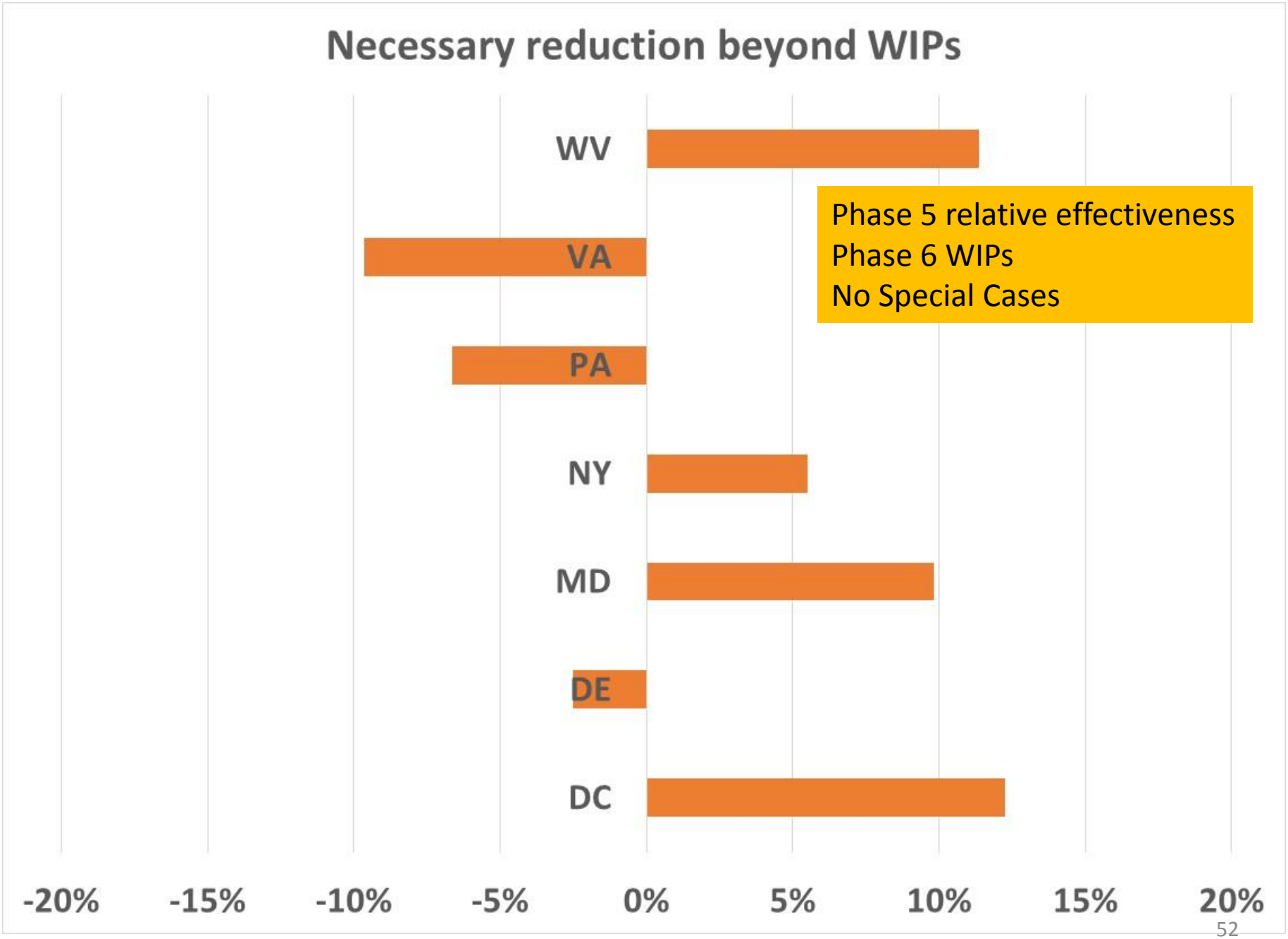
Changed Twice since Allocation
In 2011, Phase 1 WIPs helped to set the planning targets for phase 2 WIPs

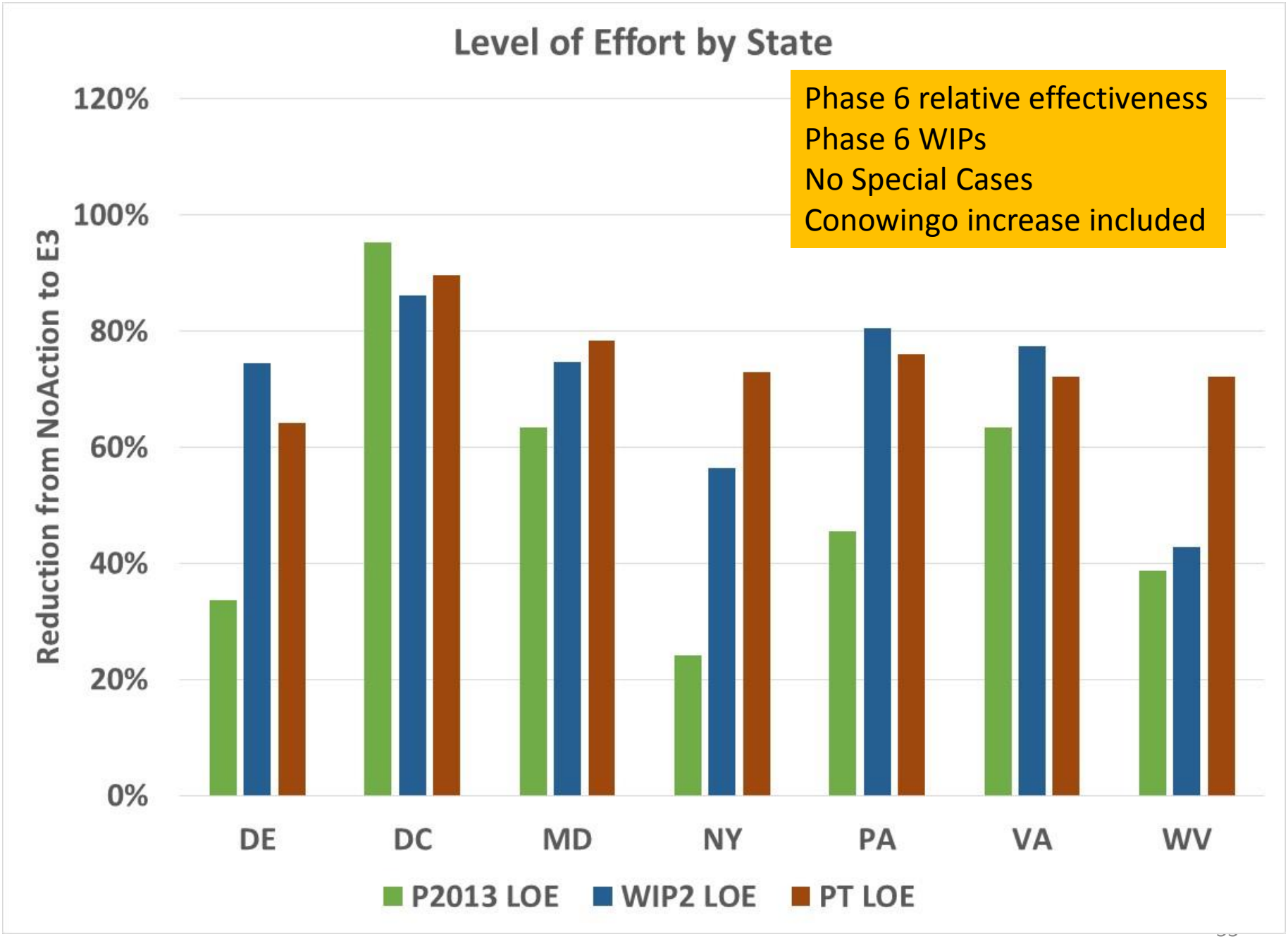
- No action and E3 definitions

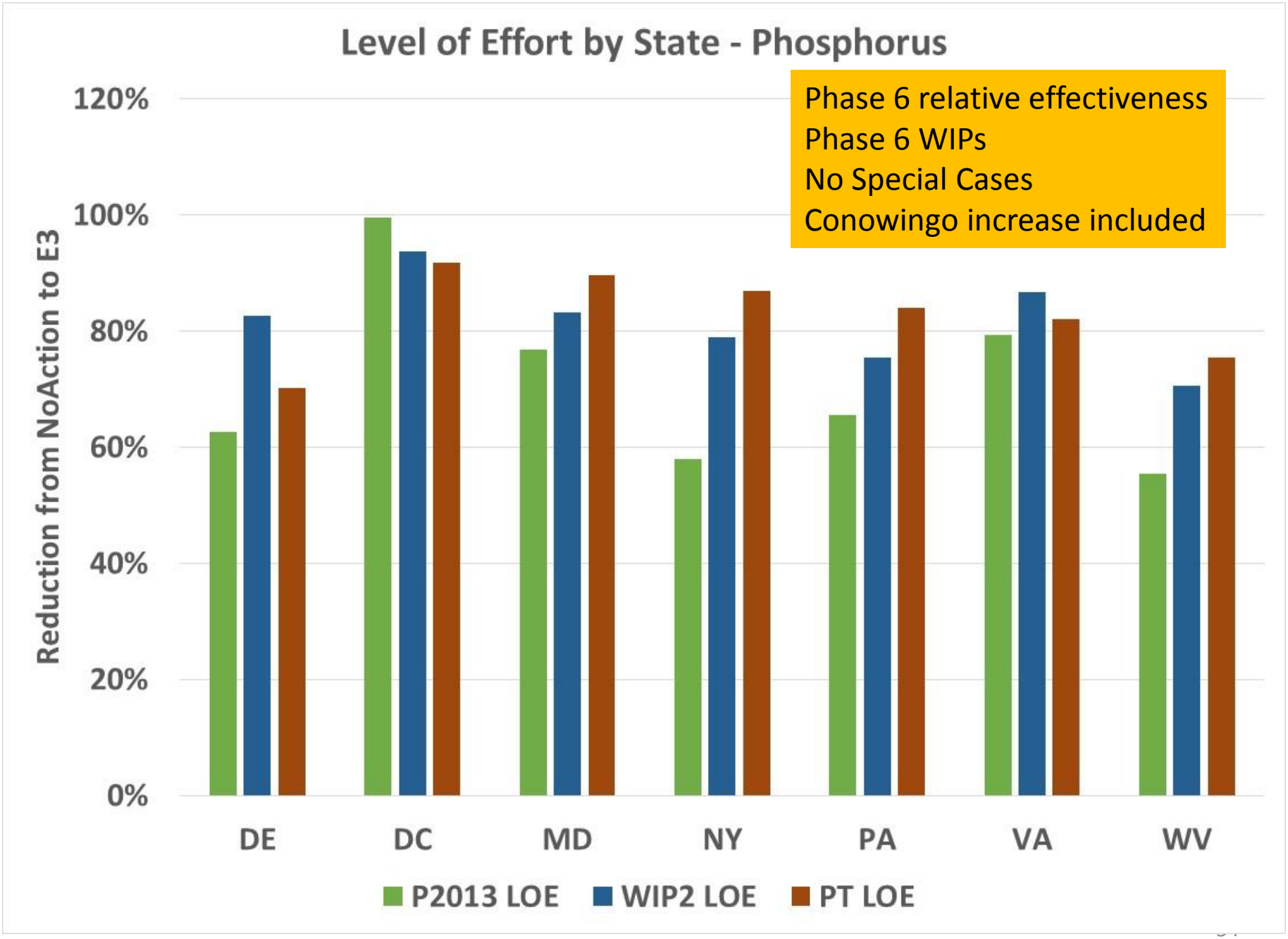
- Caveat - WIPs are not perfectly translated

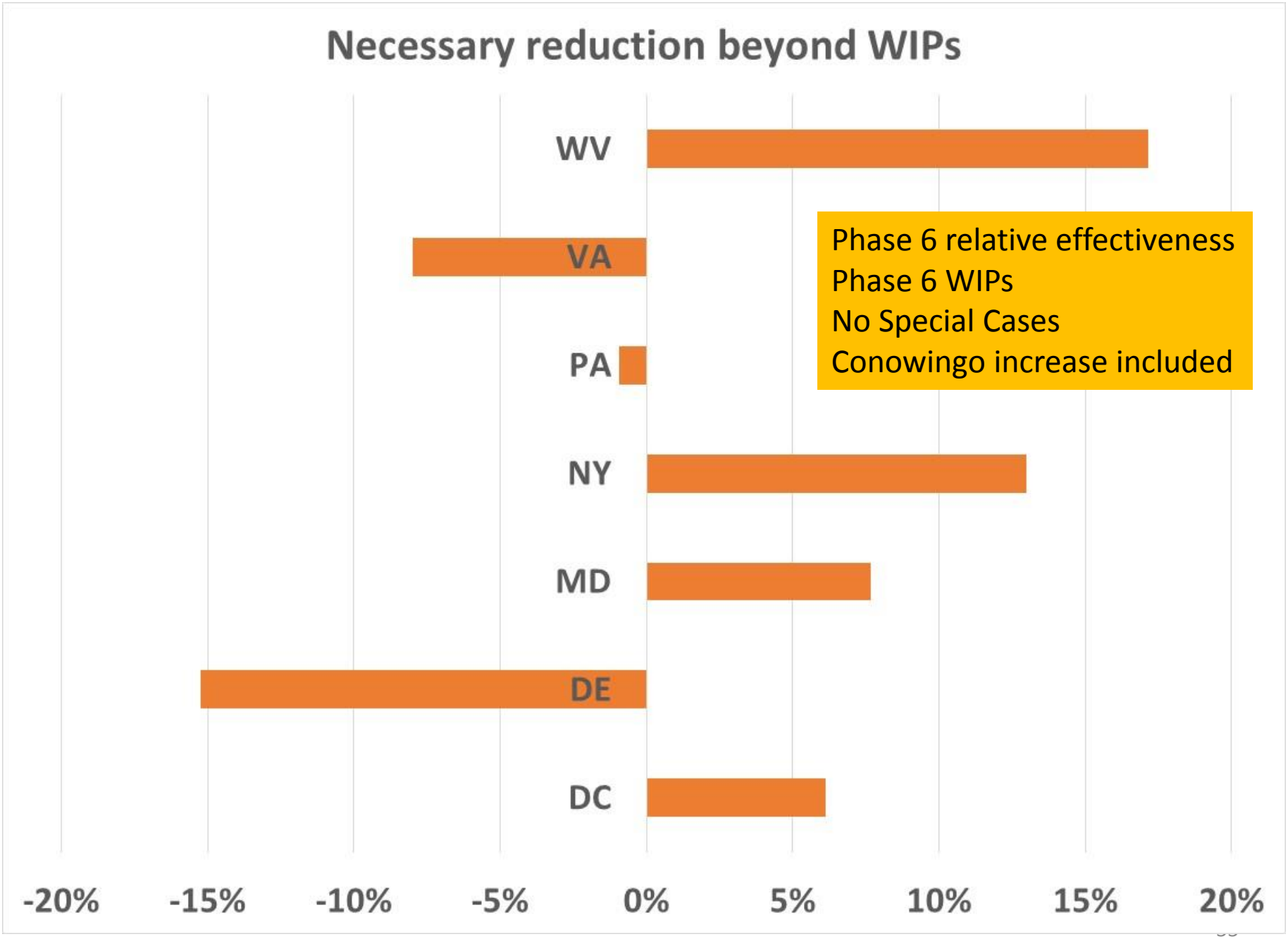

Level of Effort by State - Nitrogen
Phase 5 relative effectiveness
Phase 6 WIPs
No Special Cases
Reduction from NoAction to E3
120%
100%
80%
60%
40%
20%
0%
DE
DC
MD
NY
PA
VA
WV
P2013 LOE
WIP2 LOE
PT LOE

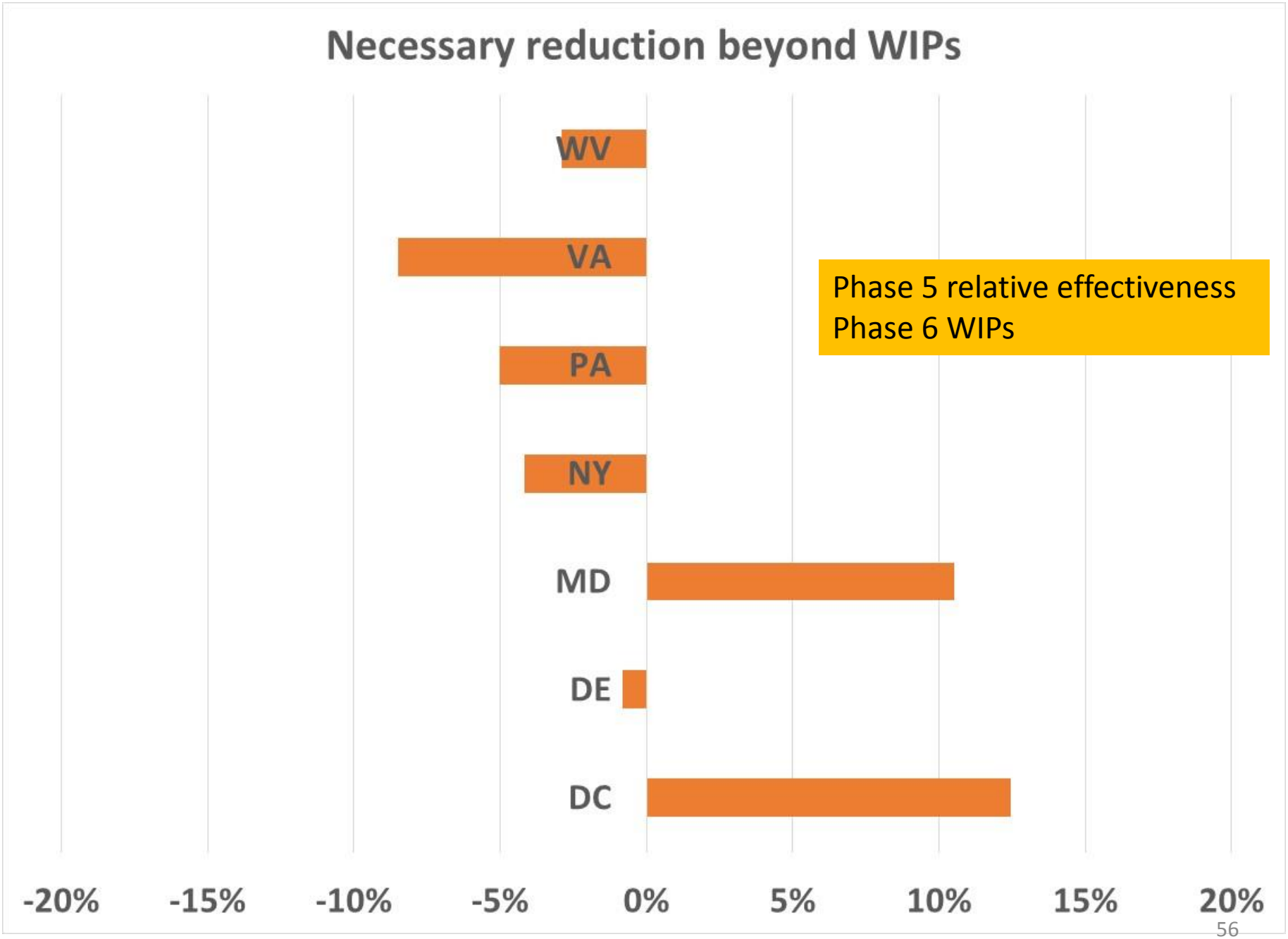

Level of Effort by State - Phosphorus
Phase 5 relative effectiveness
Phase 6 WIPs
No Special Cases
Reduction from NoAction to E3
120%
100%
80%
60%
40%
20%
0%
DE
DC
MD
NY
PA
VA
WV
P2013 LOE
WIP2 LOE
PT LOE

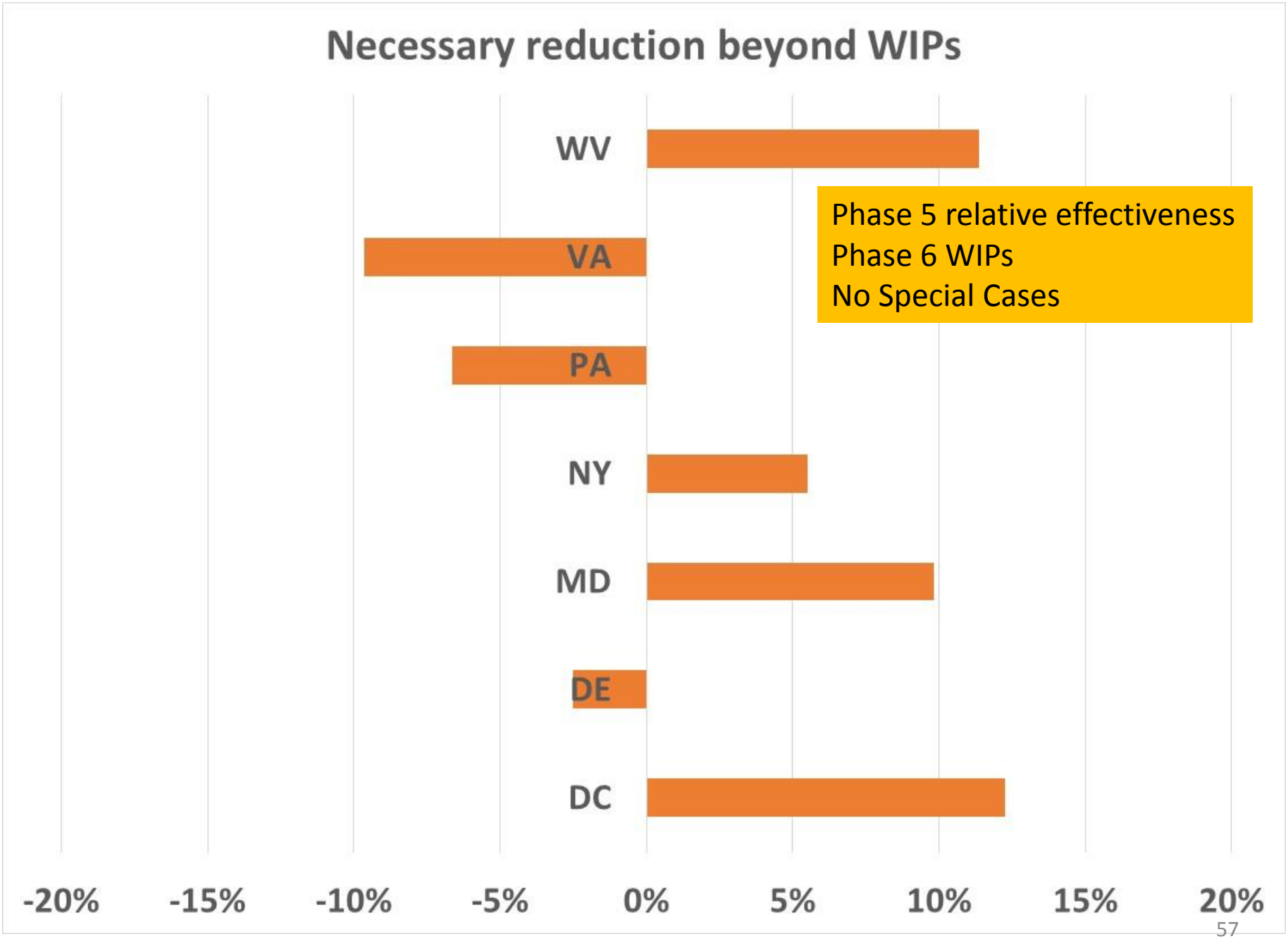

Necessary reduction beyond WIPs
WV
VA
PA
NY
MD
DE
DC
Phase 5 relative effectiveness
Phase 6 WIPs
No Special Cases
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%

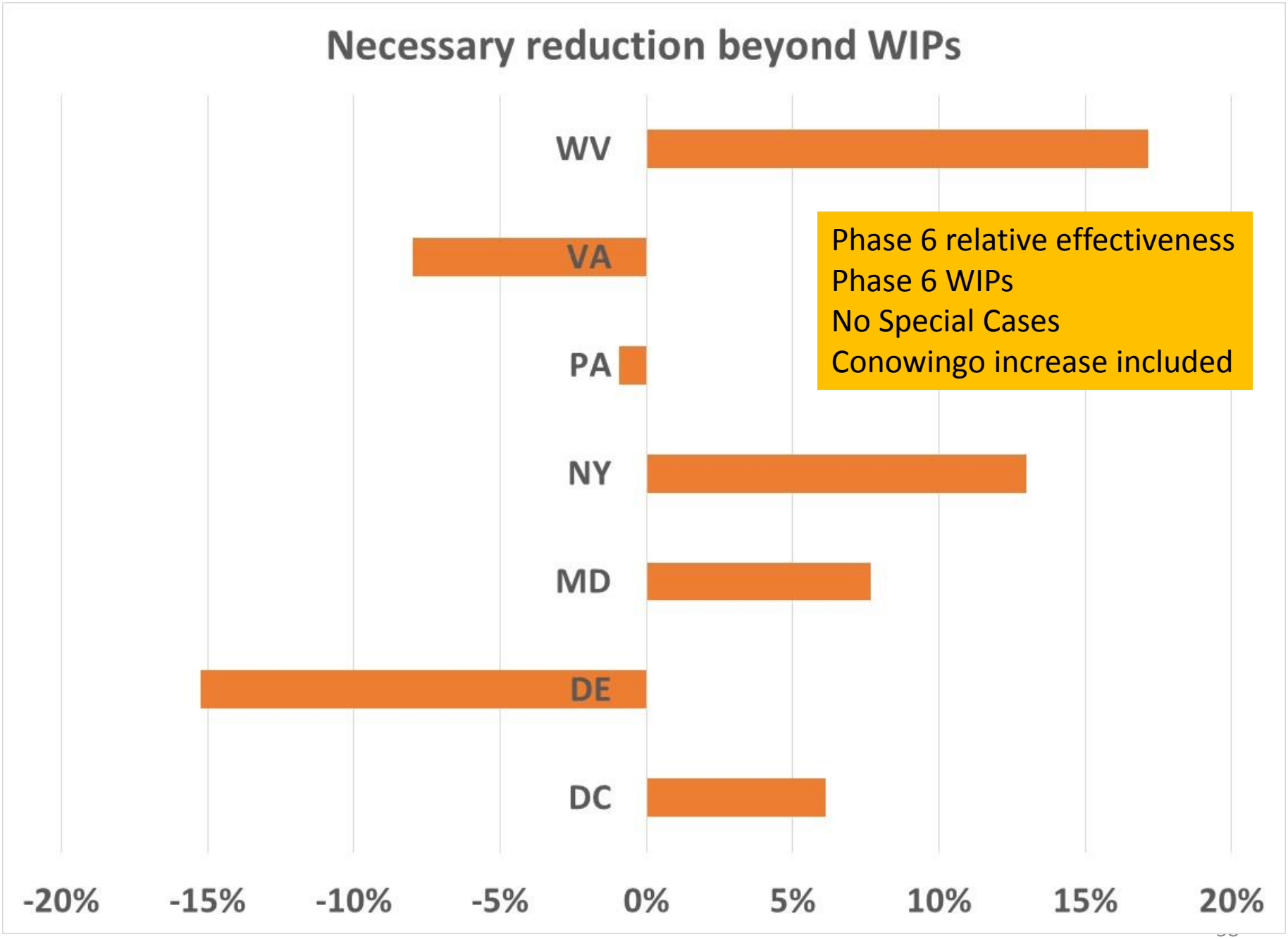

Level of Effort by State
Phase 6 relative effectiveness
Phase 6 WIPs
No Special Cases
Conowingo increase included
Reduction from NoAction to E3
120%
100%
80%
60%
40%
20%
0%
DE
DC
MD
NY
PA
VA
WV
P2013 LOE
WIP2 LOE
PT LOE


Level of Effort by State - Phosphorus
Phase 6 relative effectiveness
Phase 6 WIPs
No Special Cases
Conowingo increase included
Reduction from NoAction to E3
120%
100%
80%
60%
40%
20%
0%
DE
DC
MD
NY
PA
VA
WV
P2013 LOE
WIP2 LOE
PT LOE


Necessary reduction beyond WIPs
WV
VA
PA
NY
MD
DE
DC
Phase 6 relative effectiveness
Phase 6 WIPs
No Special Cases
Conowingo increase included
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%


Necessary reduction beyond WIPs
WV
VA
PA
NY
MD
DE
DC
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%
Phase 5 relative effectiveness
Phase 6 WIPs


Necessary reduction beyond WIPs
WV
VA
PA
NY
MD
DE
DC
Phase 5 relative effectiveness
Phase 6 WIPs
No Special Cases
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%


Necessary reduction beyond WIPs
WV
VA
PA
NY
MD
DE
DC
Phase 6 relative effectiveness
Phase 6 WIPs
No Special Cases
Conowingo increase included
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%

What will change between now and final planning targets

- Geographic relative effectiveness
  - Watershed Delivery – updated based on final calibrated watershed model
- Absolute Loads
  - Updated based on final calibrated watershed model
- Updated Bay assimilative capacity
- Partnership decisions on scenario year, Conowingo, and Climate Change
- Factoring in jurisdictions' requests for special cases
- Factoring in jurisdictions' request for N for P, P for N exchanges

Upcoming Requests for Decisions

- Scenario Year – Today 1-3pm
  - Year for no action and E3 used in the planning target calculations
- Conowingo – Today 3-5pm
  - Who is responsible for additional load
  - When to address additional load
- Climate Change – Tomorrow 10am-noon
  - How to incorporate climate change