
DEQ
VIRGINIA DEPARTMENT OF
ENVIRONMENTAL QUALITY

Dissolved Oxygen Equivalent Number

February 2, 2023 - Watershed Technical Workgroup

William Keeling
NPS Modeling and Data Coordinator
VA Dept. of Environmental Quality

Acronyms

- E3 – Everything, Everywhere, by Everyone theoretical max scenario
- TN – Total Nitrogen
- TP – Total Phosphorus
- AFL – Above the Fall Line
- BFL – Below the Fall Line
- DO – Dissolved Oxygen
- VA – Commonwealth of Virginia
- PSC – Principals' Staff Committee
- EOT – Edge of Tide
- CC – Climate Change
- WIP – Watershed Implementation Plan
- CAST – Chesapeake Assessment and Scenario Tool

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Origination – an equitable allocation process

Appendix K – Chesapeake Bay TMDL

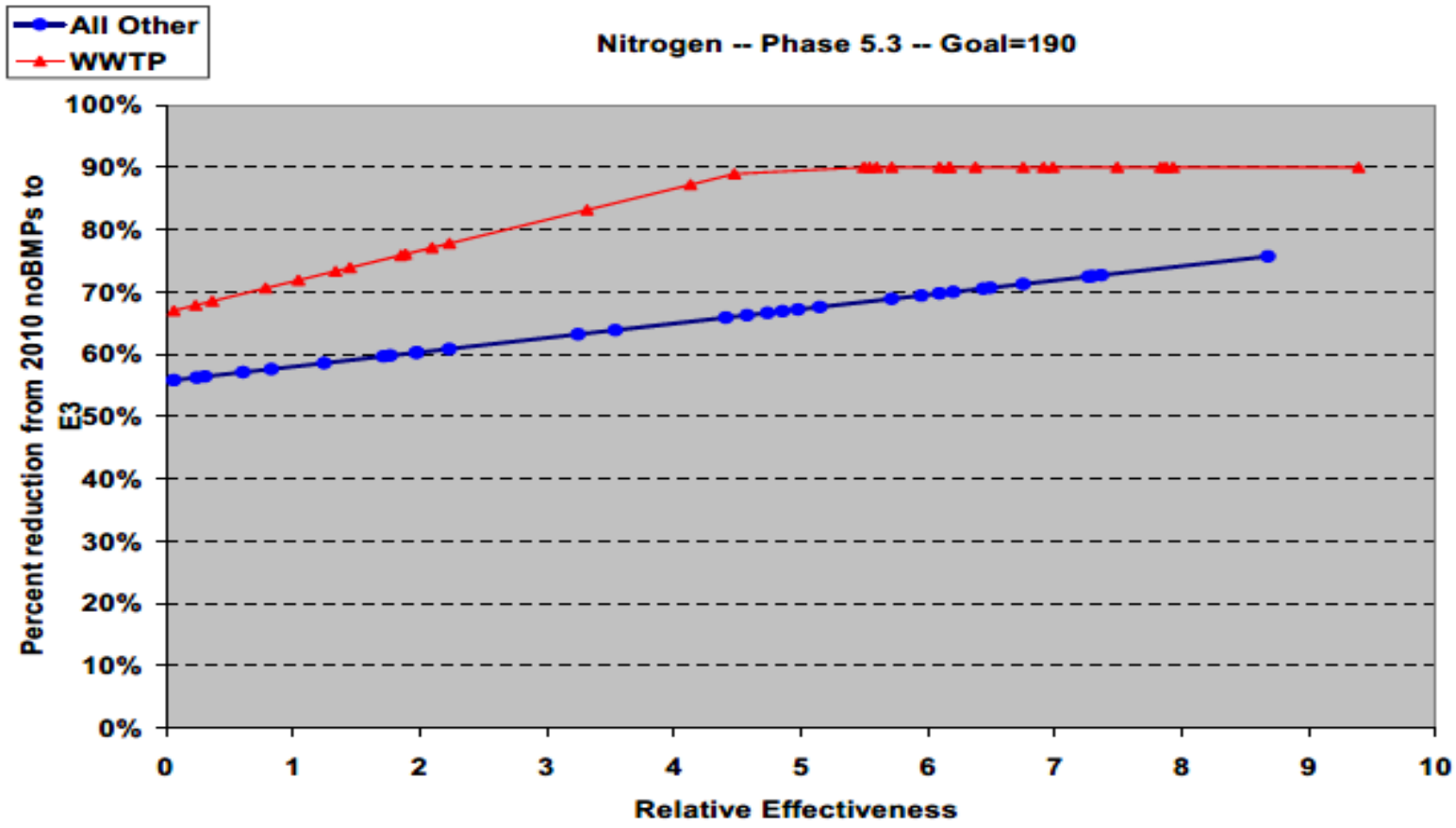

Figure K-2. Allocation methodology example showing the hockey stick and straight line reductions approaches, respectively, to wastewater (red line) and all other sources (blue line).

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Quartile Factors calculated

	Quartile change per 1,000,000 lbs TN or TP	
Virginia Basin		
	N	P
Potomac AFL	14.045	22.210
Potomac BFL	13.201	22.165
Rappahannock AFL	8.065	11.765
Rappahannock BFL	9.278	15.453
York AFL	4.630	9.111
York BFL	5.165	8.681
James AFL	2.647	7.673
James BFL	2.351	7.434
Virginia Eastern Shore	15.214	20.404

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Dissolved Oxygen Equivalent Number

- Single number derived from TN and TP loadings multiplied by quartile values for each tributary basin - the higher the loadings the larger the equivalent number the lower the DO
- Related to the damage done to or equivalent remaining DO level in the critical Bay segments by the combined effect of both nutrients loading and tributary basin of origin
- EPA established targets calculate to a single DO Equivalent Number

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Targets

State Basin	Initial 2018 Planning Targets			2018 PSC Planning Targets			2019 Targets with Exchanges		
	TN	TP	DO Equivalent	TN	TP	DO Equivalent	TN	TP	DO Equivalent
VA Eastern Shore	1.42	0.164	24.996	1.43	0.164	25.178	1.83	0.15	30.894
VA James	26.01	2.758	84.967	25.92	2.731	84.556	21.81	2.24	70.709
VA Potomac	15.98	1.867	260.338	16.00	1.892	261.070	16.51	1.82	266.663
VA Rappahannock	6.86	0.840	70.838	6.85	0.849	70.847	7.09	0.82	72.498
VA York	5.54	0.557	32.452	5.52	0.556	32.330	5.71	0.55	33.217
Total	55.82	6.186	474	55.73	6.192	474	52.95	5.58	474

Example calculations using weighted average quartile values

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Adjustments

State Basin	2018 Climate Adjustments			2020 Climate Adjustments		
	TN	TP	DO Equivalent	TN	TP	DO Equivalent
VA Eastern Shore	0.11	0.005	1.771	0.01	0.000	0.109
VA James	0.48	0.059	1.623	0.30	0.143	1.831
VA Potomac	0.62	0.082	10.337	0.56	0.073	9.342
VA Rappahannock	0.31	0.027	3.052	0.54	0.102	6.081
VA York	0.20	0.014	1.134	0.17	0.018	1.012
Total	1.72	0.19	18	1.59	0.337	18

Example calculations using weighted average quartile values

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Adjusted Targets

State Basin	2018 PSC Targets with 2018 CC			2018 PSC Targets with 2020 CC			2020 Targets with CC		
	TN	TP	DO Equivalent	TN	TP	DO Equivalent	TN	TP	DO Equivalent
VA Eastern Shore	1.32	0.160	23.406	1.43	0.164	25.068	1.82	0.15	30.784
VA James	25.45	2.672	82.933	25.62	2.588	82.725	21.51	2.10	68.878
VA Potomac	15.37	1.810	250.733	15.43	1.819	251.728	15.95	1.75	257.321
VA Rappahannock	6.54	0.821	67.794	6.31	0.747	64.766	6.54	0.72	66.417
VA York	5.32	0.543	31.196	5.35	0.538	31.318	5.54	0.53	32.205
Total	54.00	6.006	456	54.14	5.86	456	51.37	5.25	456

Example calculations using weighted average quartile values

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Scenario	DO Equivalent
VA's PSC 2018 Target	474
VA's 2020 CC Target	456
VA's WIP 3 CAST17	**439**
VA's WIP 3 CAST19	**447**
VA's WIP 3 CAST21	**446**
VA's 2021 Progress	**513**

Example using weighted average quartile values

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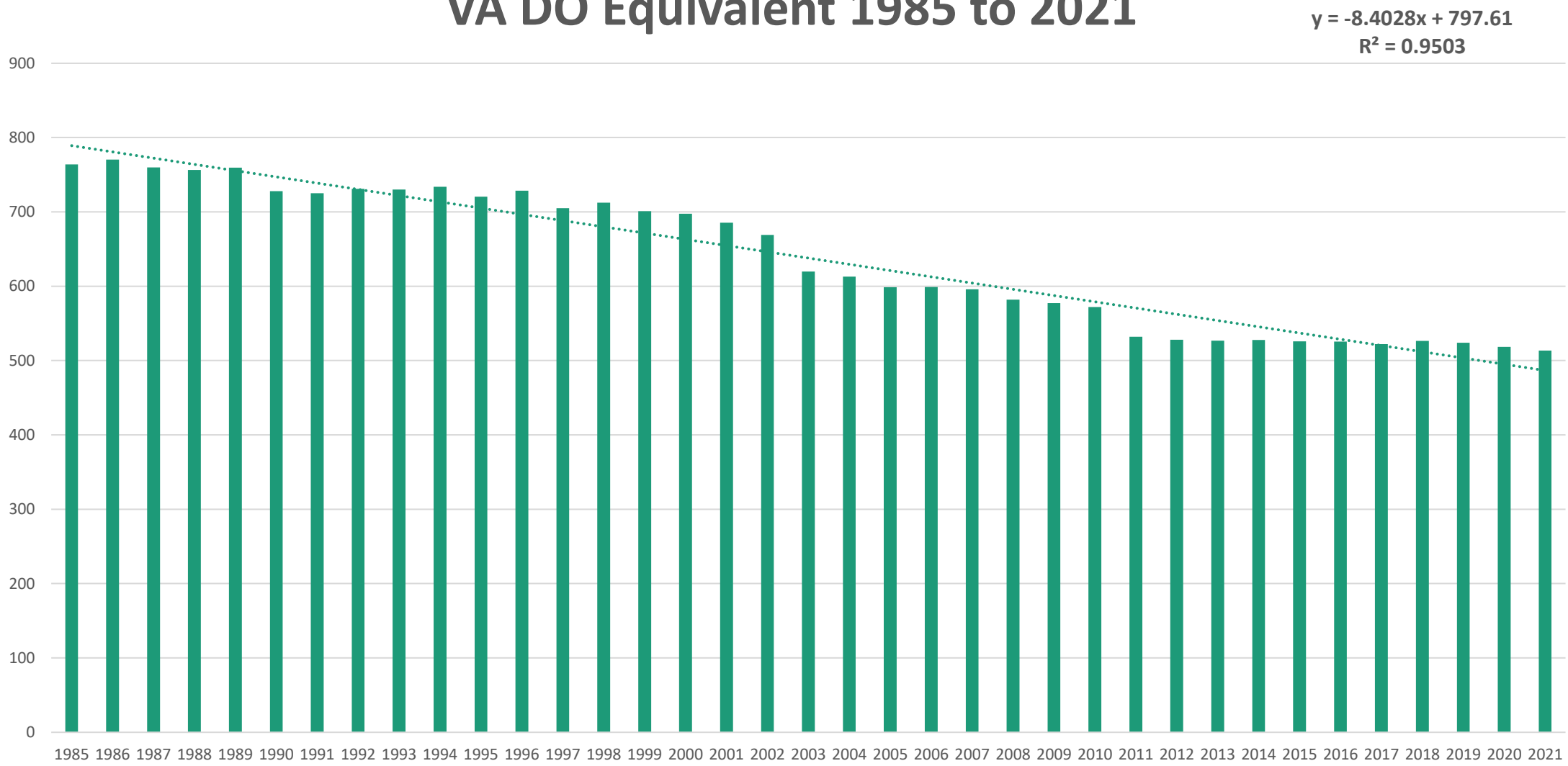
VA DO Equivalent 1985 to 2021



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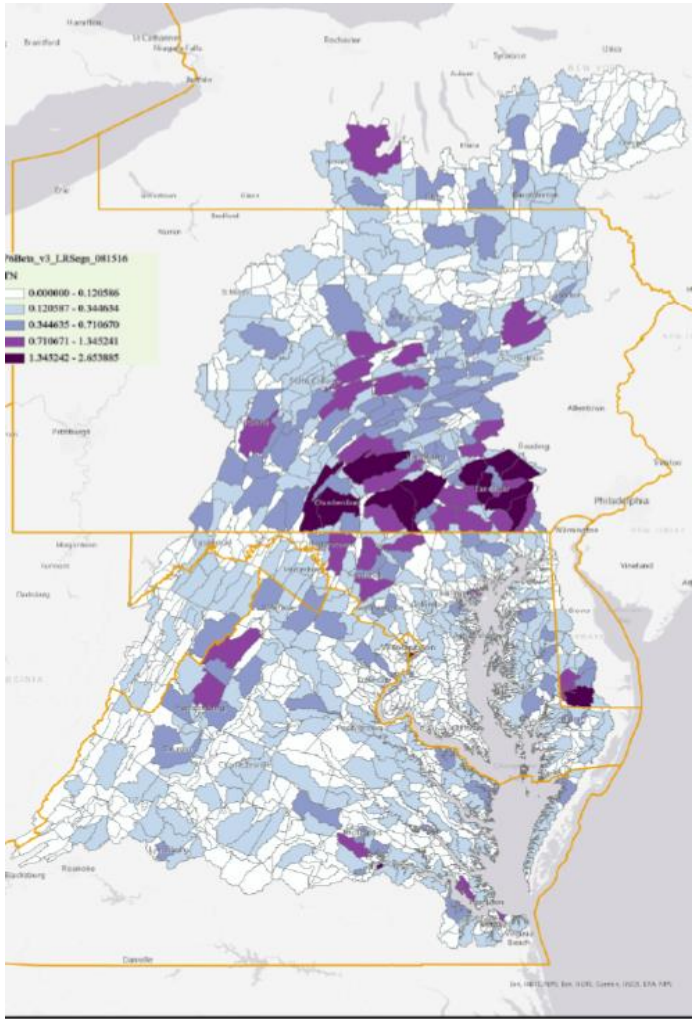
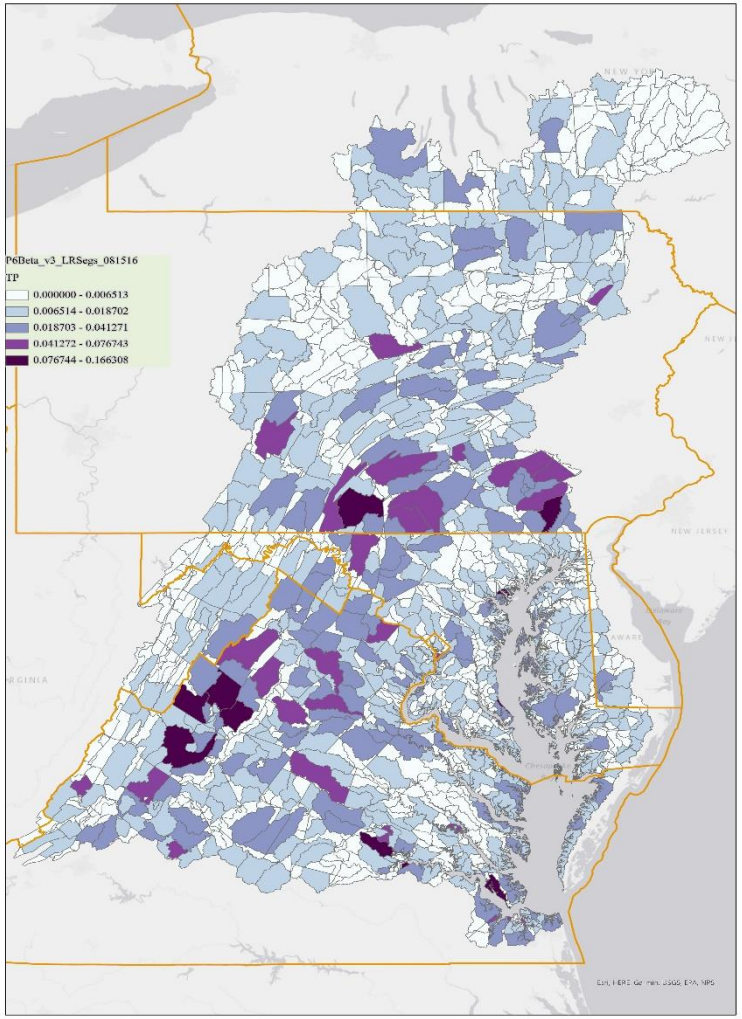
2021 Progress

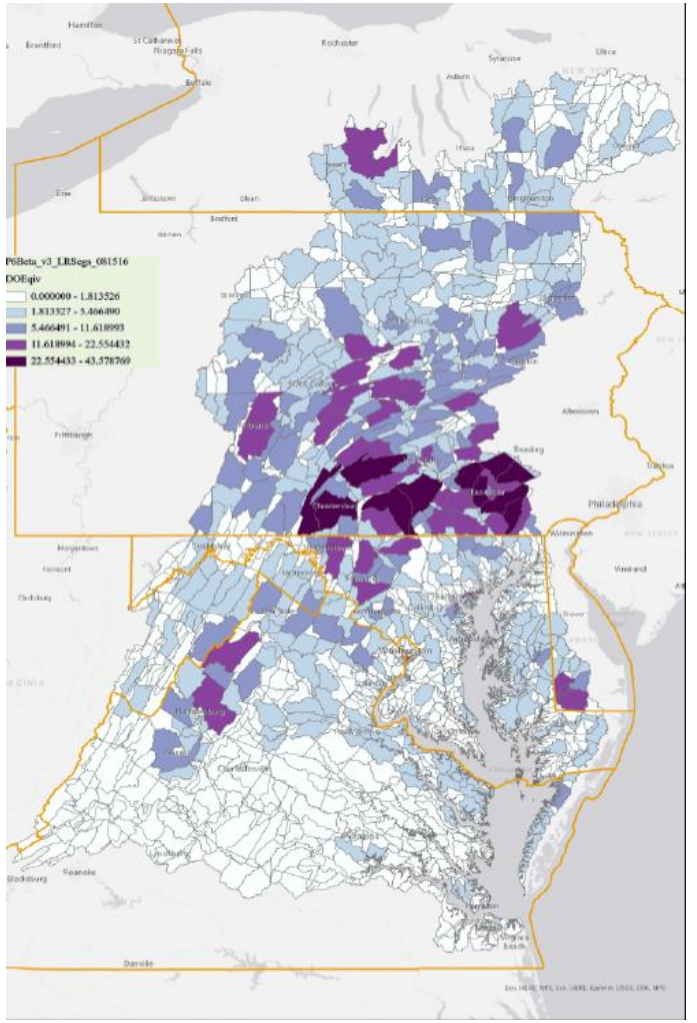
TN EOT Loads



TP EOT Loads



DO Equivalent



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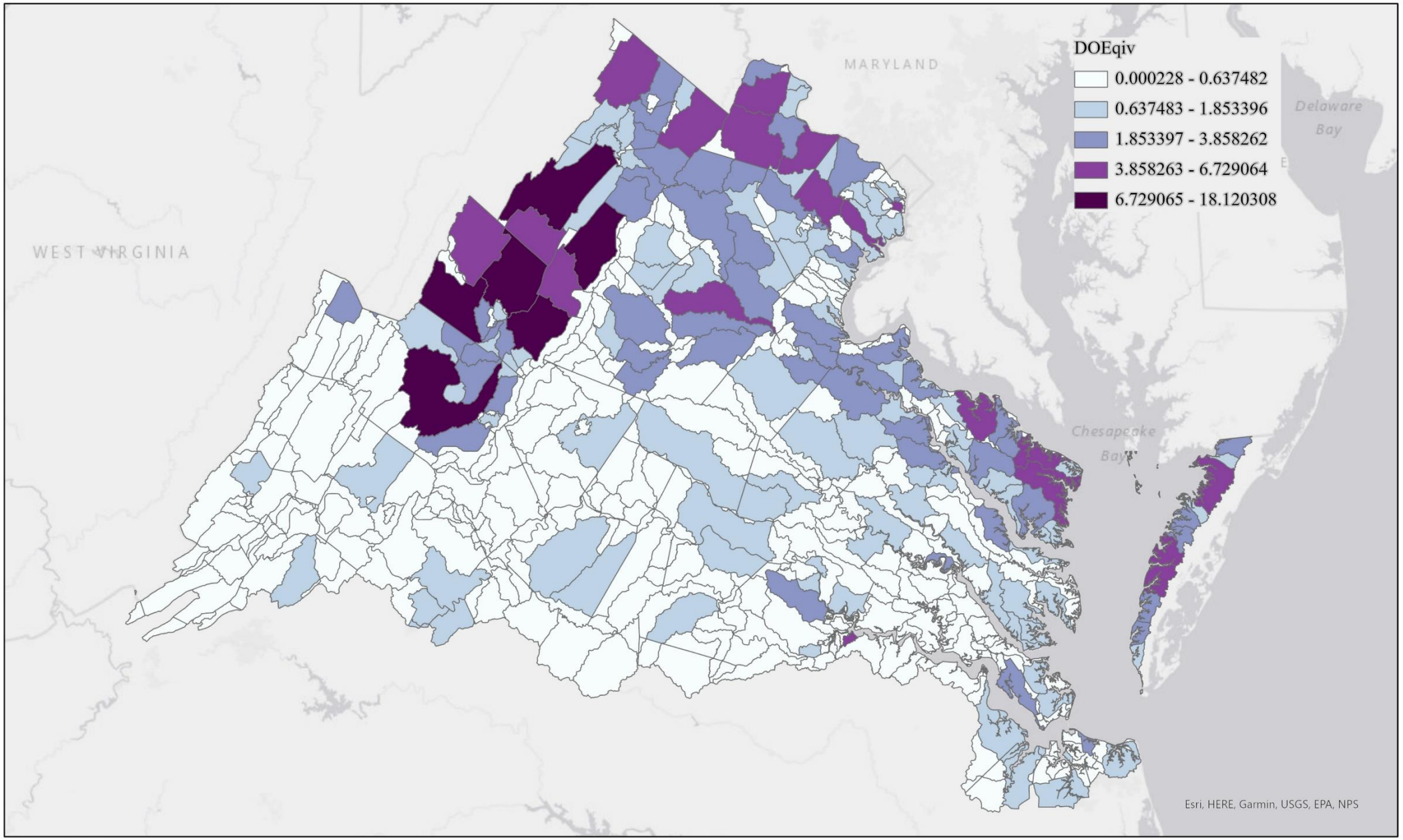

Dissolved Oxygen Equivalent Number - Implications

- For multiple tributary jurisdictions it distills targets and scenario results into a single number and easily conveys if a scenario met, exceeded, or is falling short of the target DO equivalent value
- Target watershed areas thought to be most impacting DO or for local WQ improvements
- Can be calculated for any model segment or tributary basin
- Another way to evaluate the need for exchanges within and between basins
- Allows an additional visualization of the combined impacts of TN and TP

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Discussion