Combined Sewer Simulation in CAST
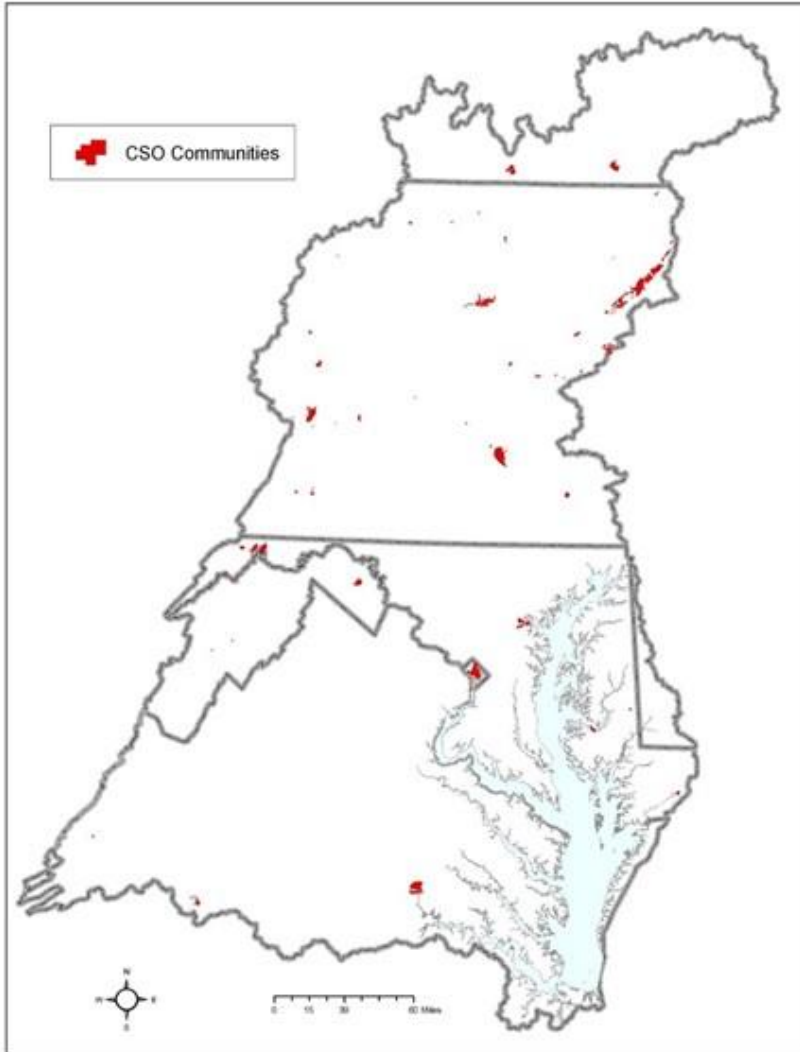
Gary Shenk – USGS

WWTWG 9/1/2020

Outline

- Calculation of CSO loads
- Categories of nutrient load in developed area
- Applying BMPs to CSOs

Calculation of CSO loads

CSO Communities

- Actual CSO loads are highly dependent on weather
  - However
- Consistent with the TMDL, CAST is an estimate of the change in N and P due to anthropogenic effects
  - Therefore
- A constant estimated load for 1991-2000 is used that is only modified by Long-Term Control Plans or climate change.
- This is consistent with every other source except WWTP which are actual loads for historical runs and permitted loads for WIP scenarios

We have great CSO data…for four facilities

- DC, Alexandria, Richmond, and Lynchburg have detailed models that were used in developing their LTCPs. The results were collected for the phase 5 model and continue to be used in Phase 6

- The other 60 CSO communities use the rainfall data and concentration assumptions

We have great CSO data...for four facilities

- Rainfall and CSO Data available from 8 of the 60 communities was used by TetraTech to develop this relationship

- Multiplied by
  - Observed concentrations (3)
  - National averages (57)

$R^2 = 0.5299$
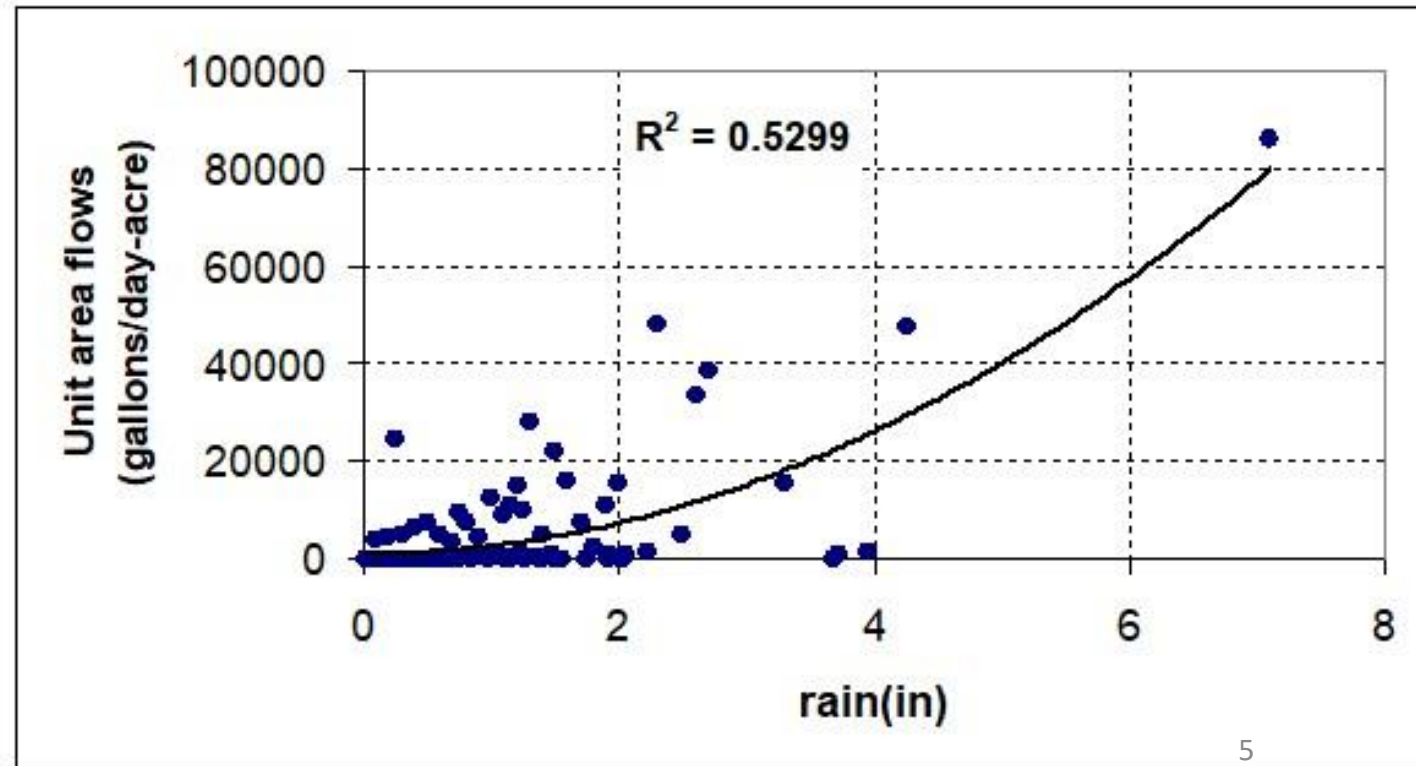
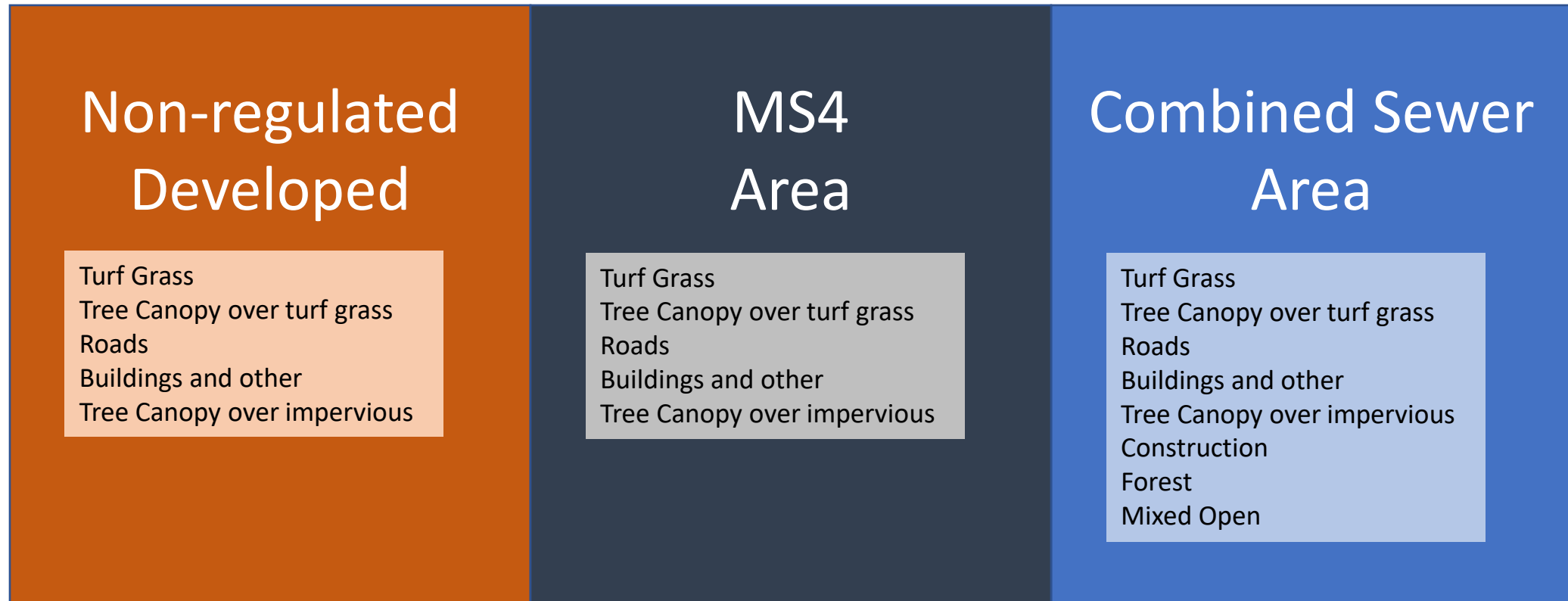# Categories of loading in developed areas

Non-regulated Developed	MS4 Area	Combined Sewer Area
↓	↓	↓ ↓
Runoff	Runoff	CSO Portion of WWTP
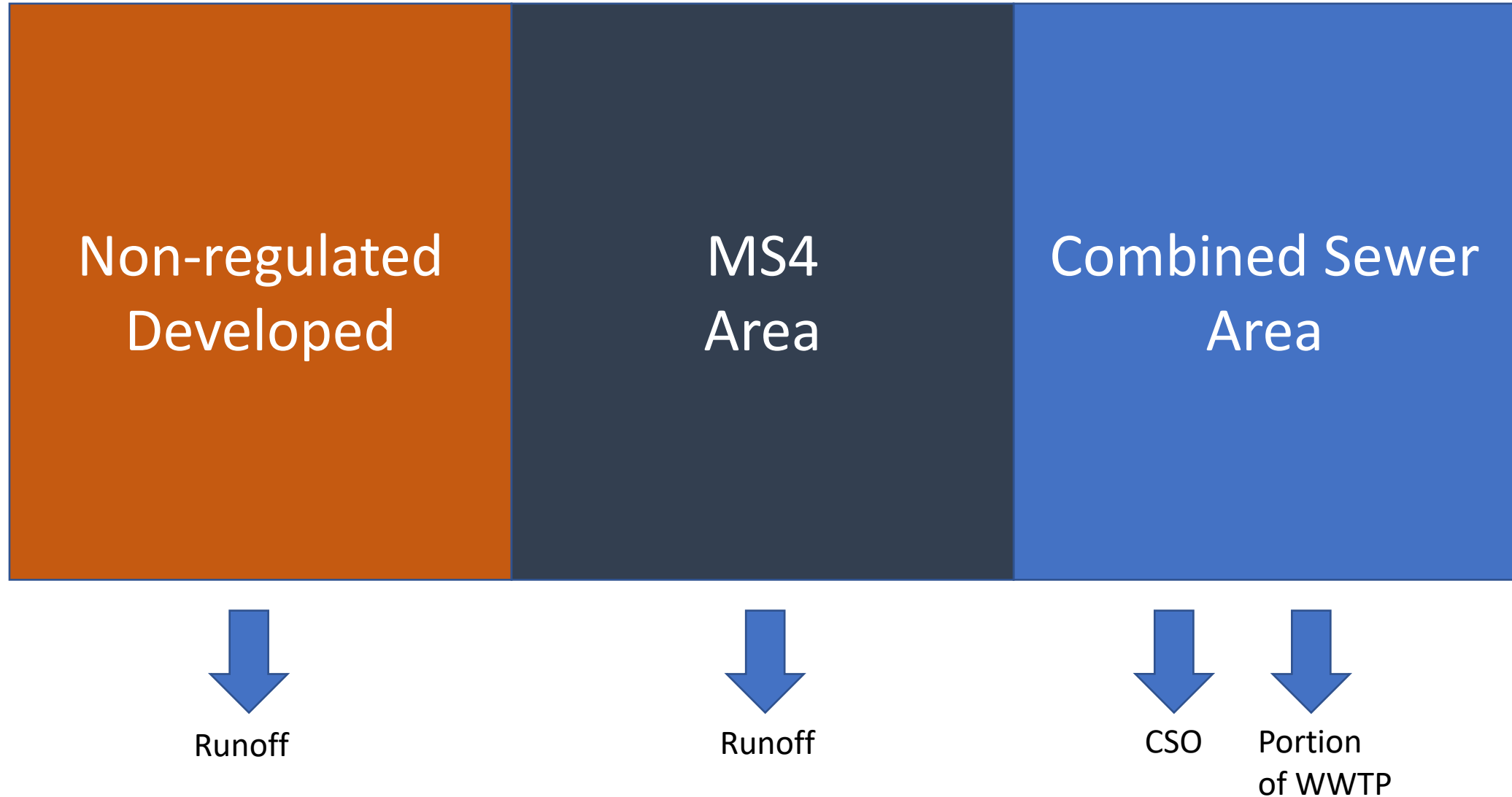
Categories of land use in developed areas

Non-regulated Developed

Turf Grass
Tree Canopy over turf grass
Roads
Buildings and other
Tree Canopy over impervious

MS4 Area

Turf Grass
Tree Canopy over turf grass
Roads
Buildings and other
Tree Canopy over impervious

Combined Sewer Area

Turf Grass
Tree Canopy over turf grass
Roads
Buildings and other
Tree Canopy over impervious
Construction
Forest
Mixed Open
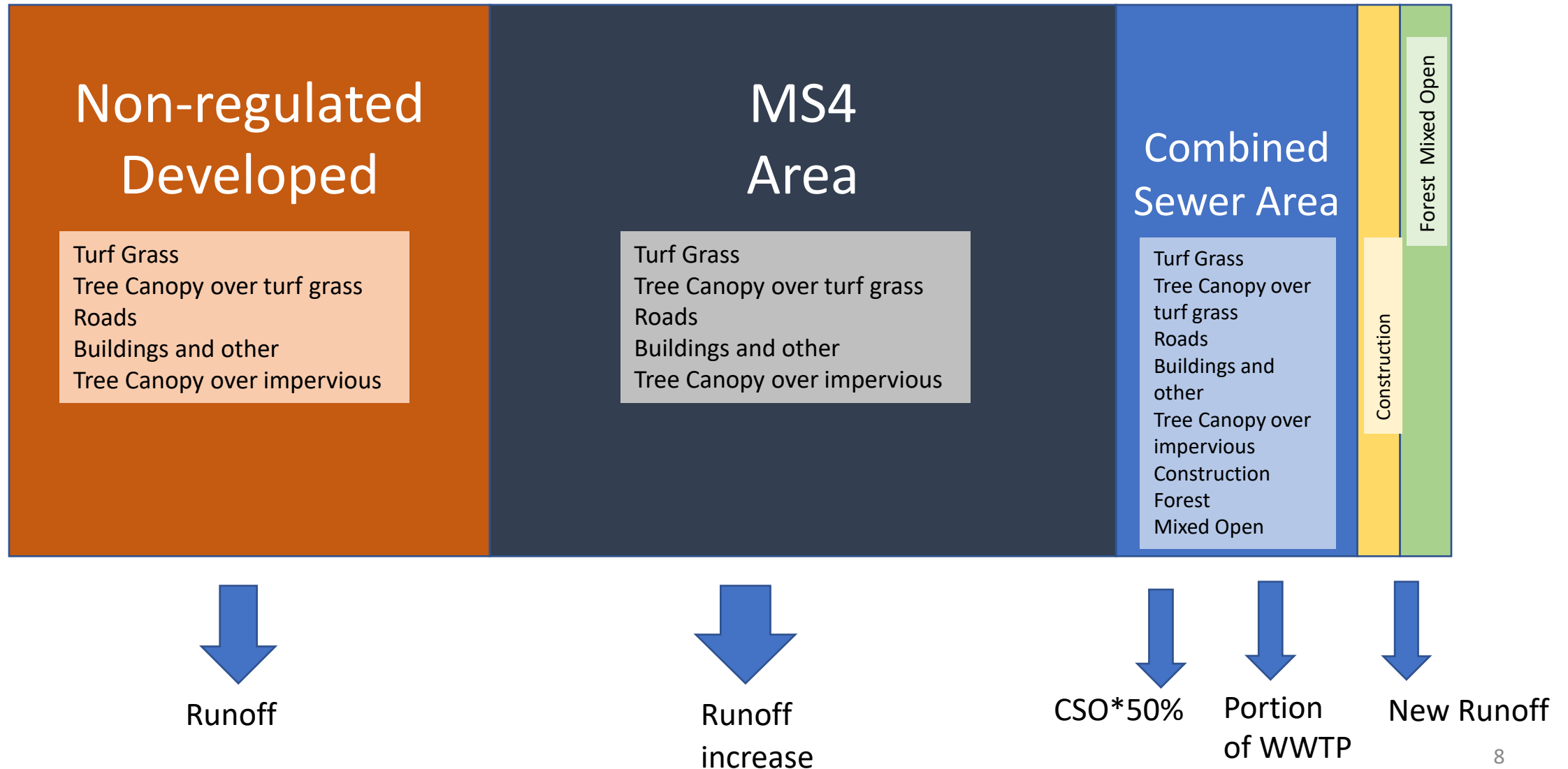
Runoff

Runoff

CSO

Portion of WWTP

Apply 50% disconnection in LTCP

Apply increase in capacity equal to 50% load reduction

Non-regulated Developed	MS4 Area	Combined Sewer Area
Turf Grass Tree Canopy over turf grass Roads Buildings and other Tree Canopy over impervious	Turf Grass Tree Canopy over turf grass Roads Buildings and other Tree Canopy over impervious	Turf Grass Tree Canopy over turf grass Roads Buildings and other Tree Canopy over impervious Construction Forest Mixed Open
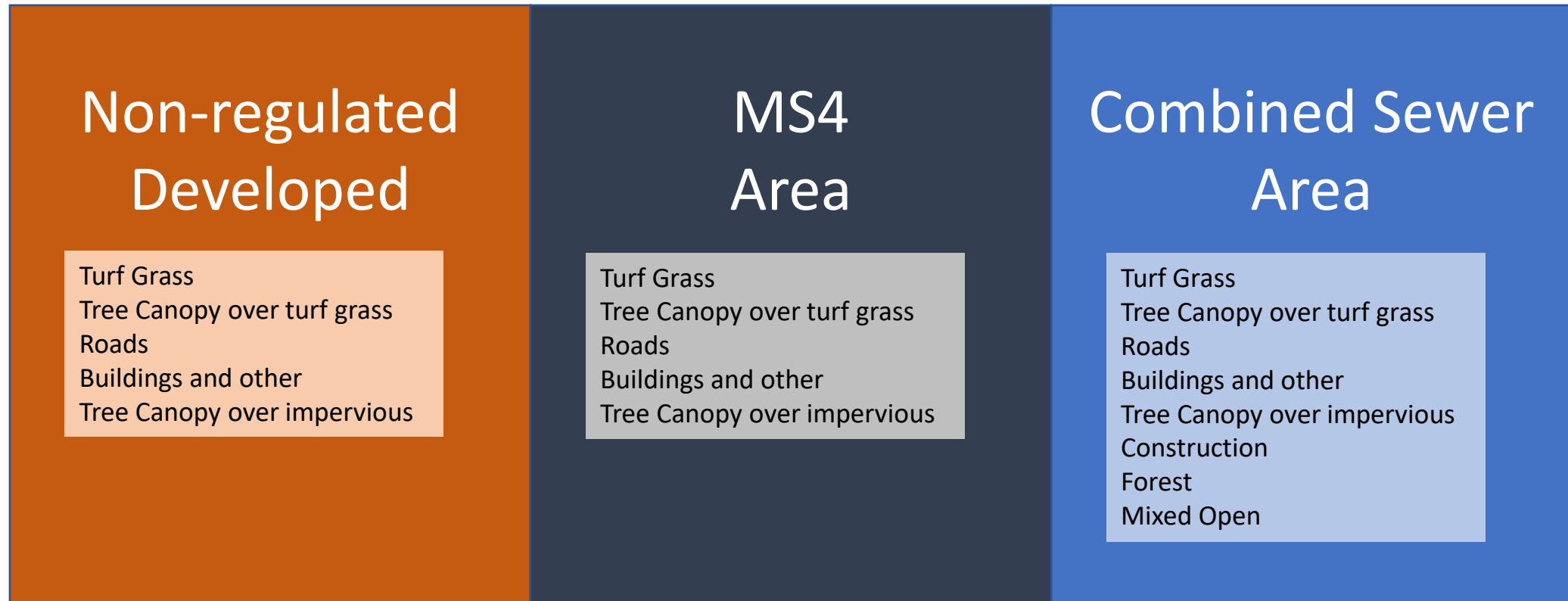
Runoff   Runoff   CSO   Portion of WWTP

Apply increase in capacity equal to 50% load reduction

Non-regulated Developed

Turf Grass
Tree Canopy over turf grass
Roads
Buildings and other
Tree Canopy over impervious

MS4 Area

Turf Grass
Tree Canopy over turf grass
Roads
Buildings and other
Tree Canopy over impervious

Combined Sewer Area

Turf Grass
Tree Canopy over turf grass
Roads
Buildings and other
Tree Canopy over impervious
Construction
Forest
Mixed Open

A reduction in WWTP loads due to implementation in LTCP is expected to be seen in the reported WWTP loads, it is not accounted separately and not included in WIPs

Runoff

Runoff

CSO*50%

Portion of WWTP

Reporting Method

NPDES	LandRiverSegment	PercentDisconnected	PercentCapacity
DE0020265	N10005EL2_4630_0000	100	0
DC0021199	N11001PL0_4510_0001	0	0
DC0021199	N11001PL1_4780_0001	38.47363	0
DC0021199	N11001PL2_4810_0000	1.552427	0
DC0021199	N11001PL2_4945_0000	0.3659785	66.90231
DC0021199	N11001PL7_4940_0000	0	0
DC0021199	N11001PL7_4910_0000	0	0

CSO Progress reported for 2019

State	Base TN	Base TP	2019 TN	2019 TP	TN redux	TP redux
DC	87414	18599	31175	6633	64%	64%
DE	2318	290	0	0	100%	100%
MD	31072	3609	16647	1806	46%	50%
NY	212015	26502	212015	26502	0%	0%
PA	1610369	255257	1287556	214906	20%	16%
VA	309605	38745	301286	37705	3%	3%
WV	62752	7844	42211	5276	33%	33%

Discussion for the WWTWG

- Any potential improvements to CSO load estimation?

- Any potential improvements to LTCP reporting process?

NPDES	LandRiverSegment	PercentDisconnected	PercentCapacity
DE0020265	N10005EL2_4630_0000	100	0
DC0021199	N11001PL0_4510_0001	0	0
DC0021199	N11001PL1_4780_0001	38.47363	0
DC0021199	N11001PL2_4810_0000	1.552427	0
DC0021199	N11001PL2_4945_0000	0.3659785	66.90231
DC0021199	N11001PL7_4940_0000	0	0
DC0021199	N11001PL7_4910_0000	0	0

State	Base TN	Base TP	2019 TN	2019 TP	TN redux	TP redux
DC	87414	18599	31175	6633	64%	64%
DE	2318	290	0	0	100%	100%
MD	31072	3609	16647	1806	46%	50%
NY	212015	26502	212015	26502	0%	0%
PA	1610369	255257	1287556	214906	20%	16%
VA	309605	38745	301286	37705	3%	3%
WV	62752	7844	42211	5276	33%	33%