Sediment Simulation in Phase 6

Gary Shenk – USGS - Chesapeake Bay Program

1/30/17

AMS





Steady State Phase 6 Model Structure

Average Load + Δ Inputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

Stream Delivery

*

River Delivery

Direct Loads

Phase 6

Keep It Simple

Average Load + ΔInputs * Sensitivity

*

Land Use Acres

*

BMPs

*

Land to Water

*

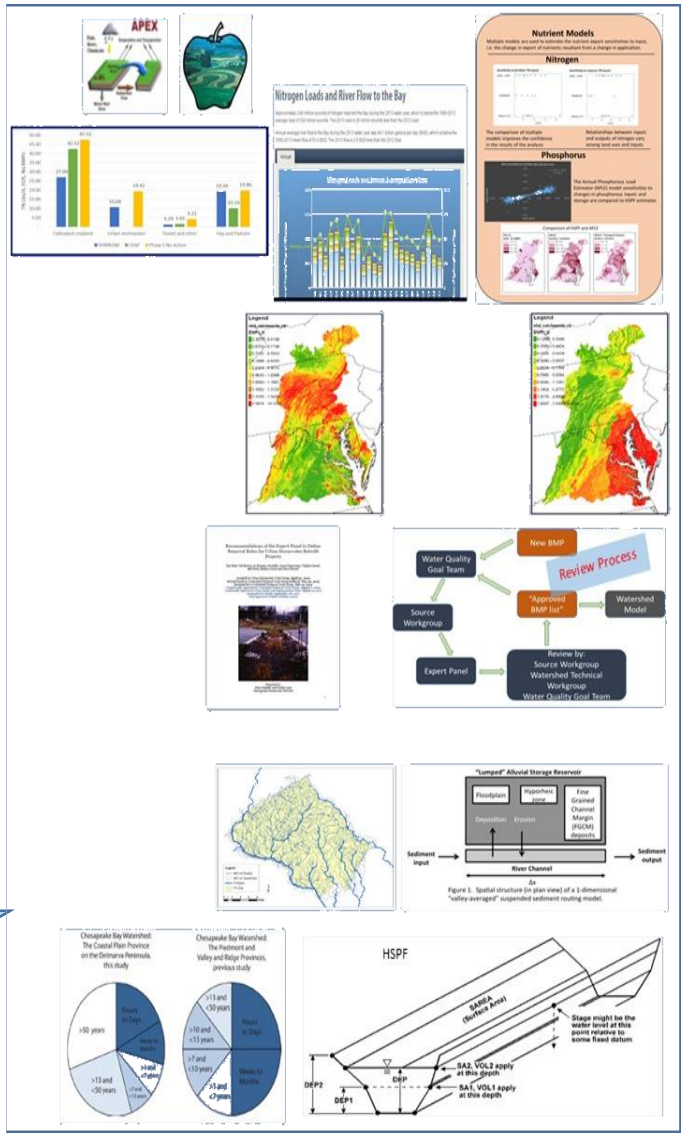
Stream Delivery

*

River Delivery

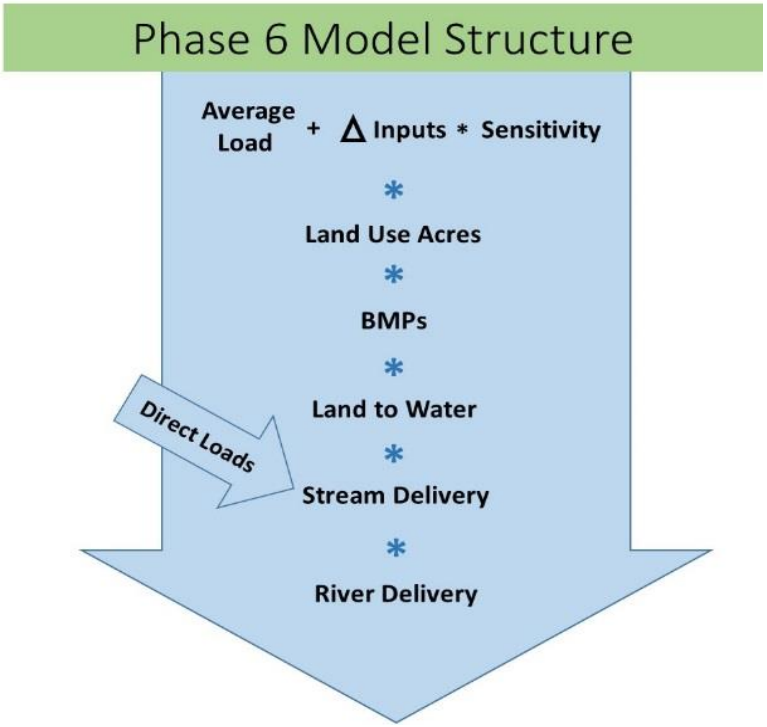
Direct Loads

Include Everything

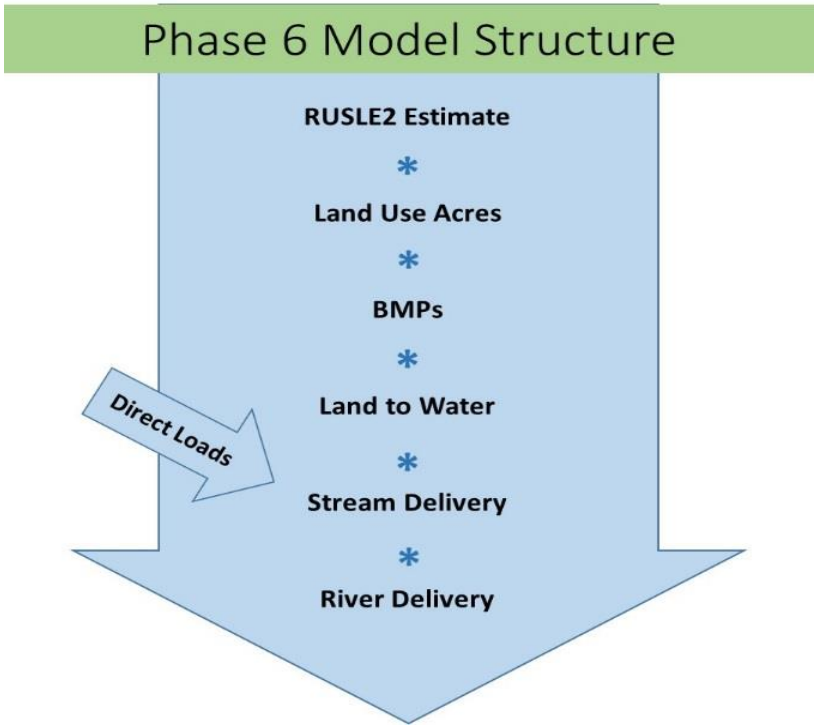


Sediment is similar to nutrients Except that RUSLE2 is used

Nutrients



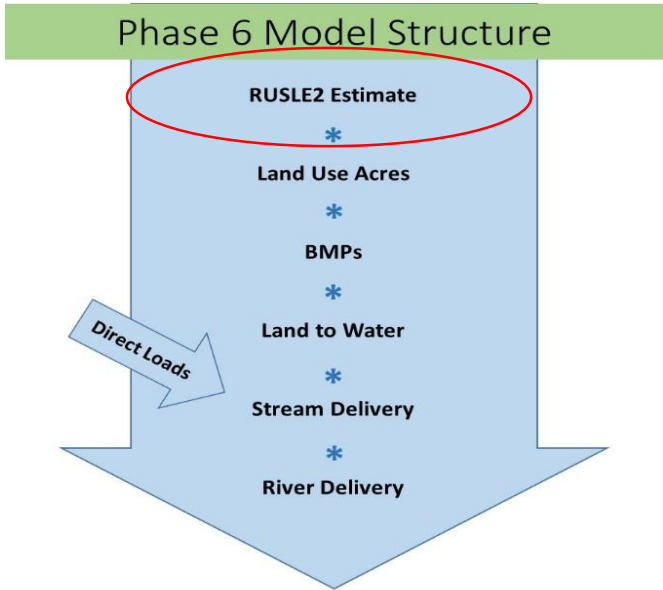
Sediment



Beta 2

RUSLE2 = Edge-of-Field Loads

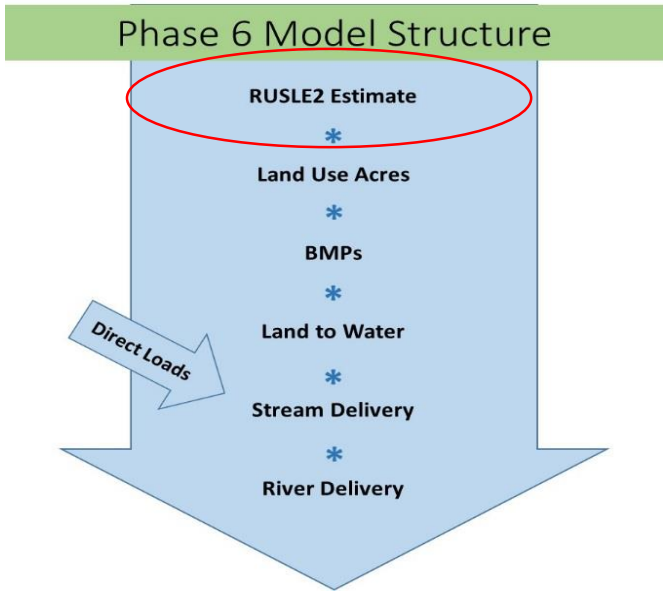
- Evaluated at the 10m Pixel Level
- Summarized to LRseg and land use
  - Forest
  - Open Space
  - Crop
  - Pasture
  - Turfgrass
  - Tree Canopy over Turfgrass



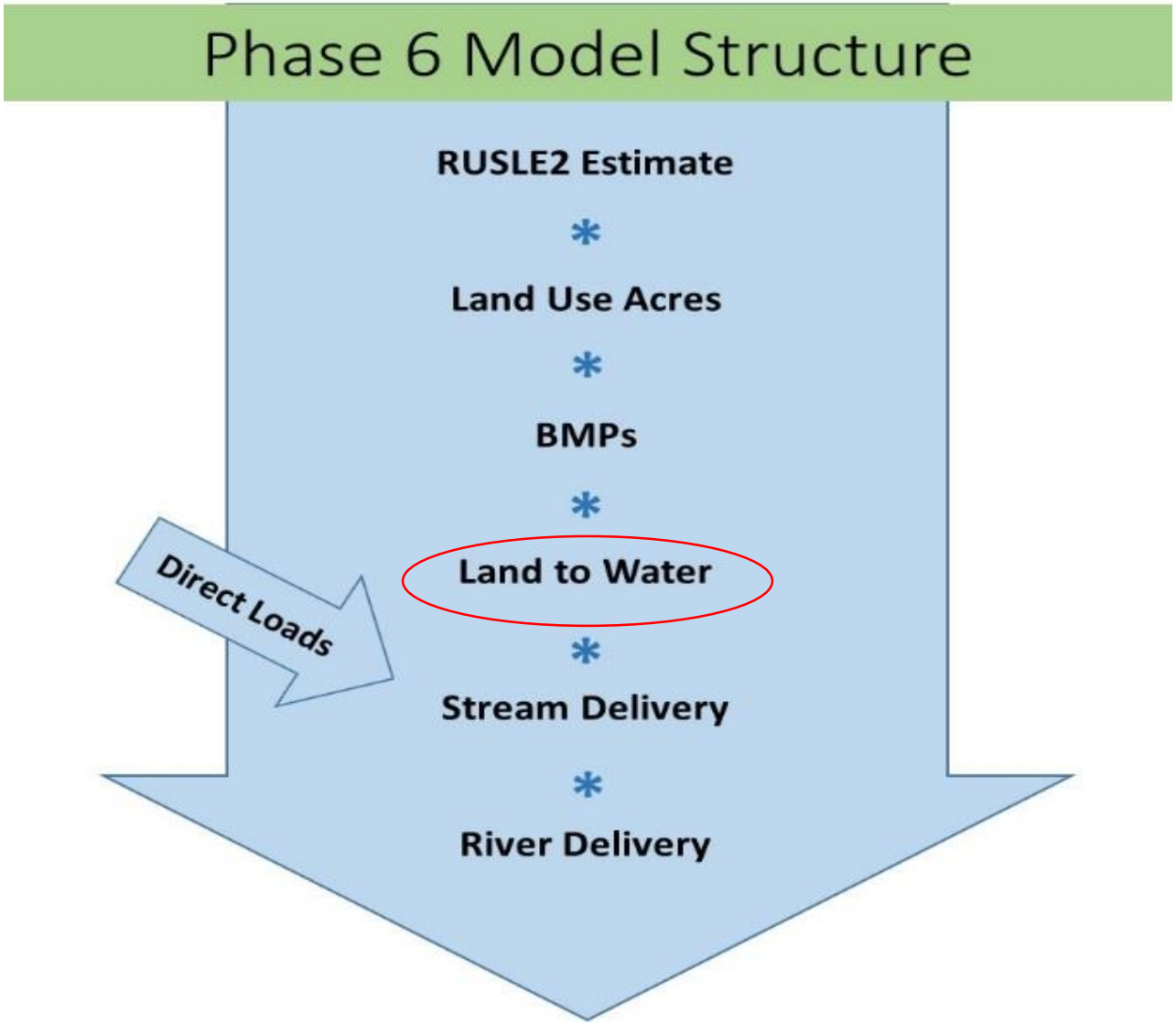
RUSLE2 => A = RKLSCP

Beta 2

- R = Runoff
  - = $1.24P^{1.36}$ P from PRISM
- K = Erodibility
  - from STATSGO and gSSURGO
- LS = slope length
  - = (Flow Accumulation x Cell Resolution / 22.1)$^{0.4}$ x (Sin(Slope x 0.01745) / 0.09)$^{1.4}$ x 1.4
- C = Cover
  - from Tetratech and AgWG
- P = Practice
  - = 1 since no action loads



Sediment Delivery Ratio



Interconnectivity Metric

Calculation related to Slope, Area, Flowpath Length, and Roughness

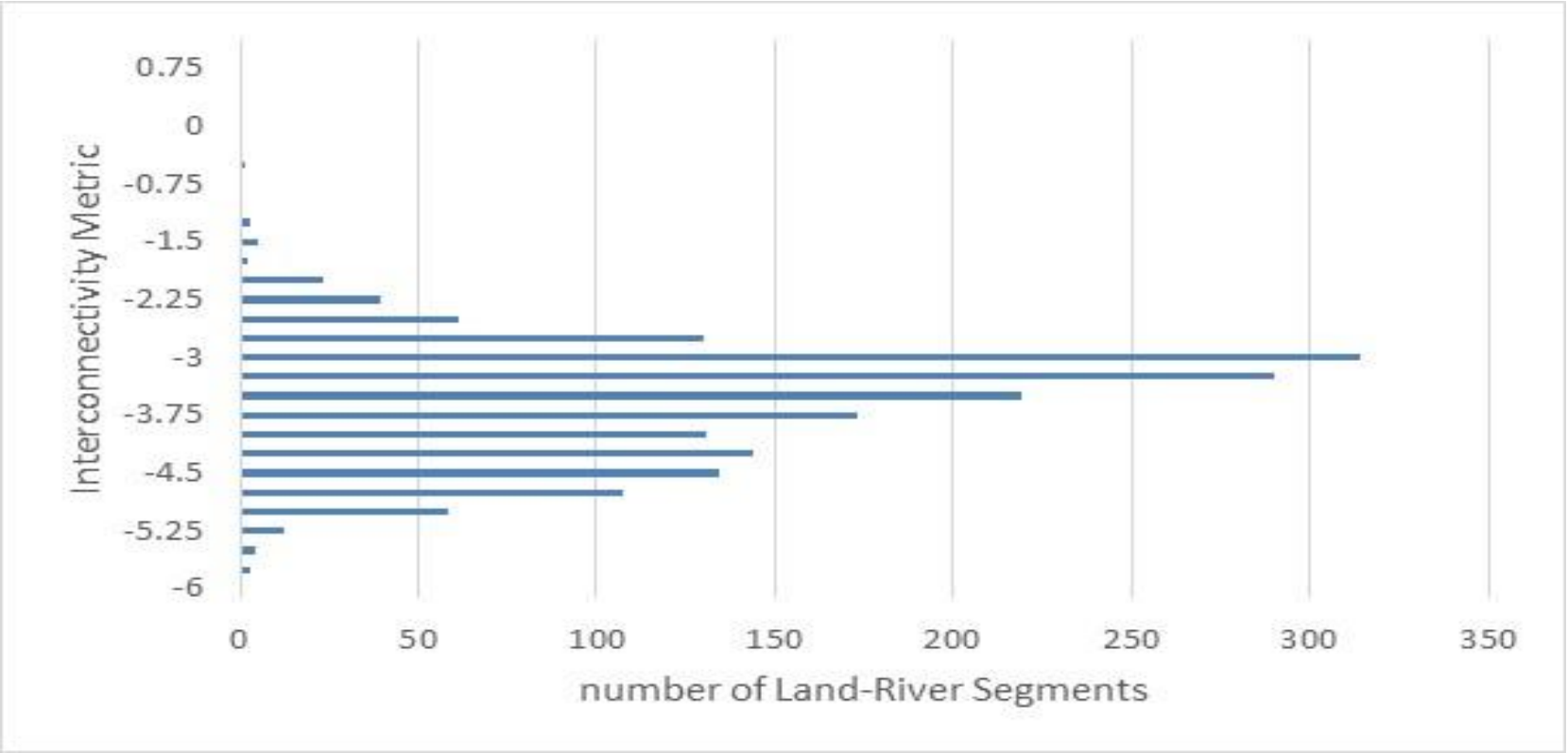
$$IC = log_{10}\left(\frac{D_{up}}{D_{dn}}\right)$$

D_{up} ~ roughness (-), Slope (+), Area (+)

D_{down} ~ roughness (-), Slope (-), distance (+)

Interconnectivity Metric

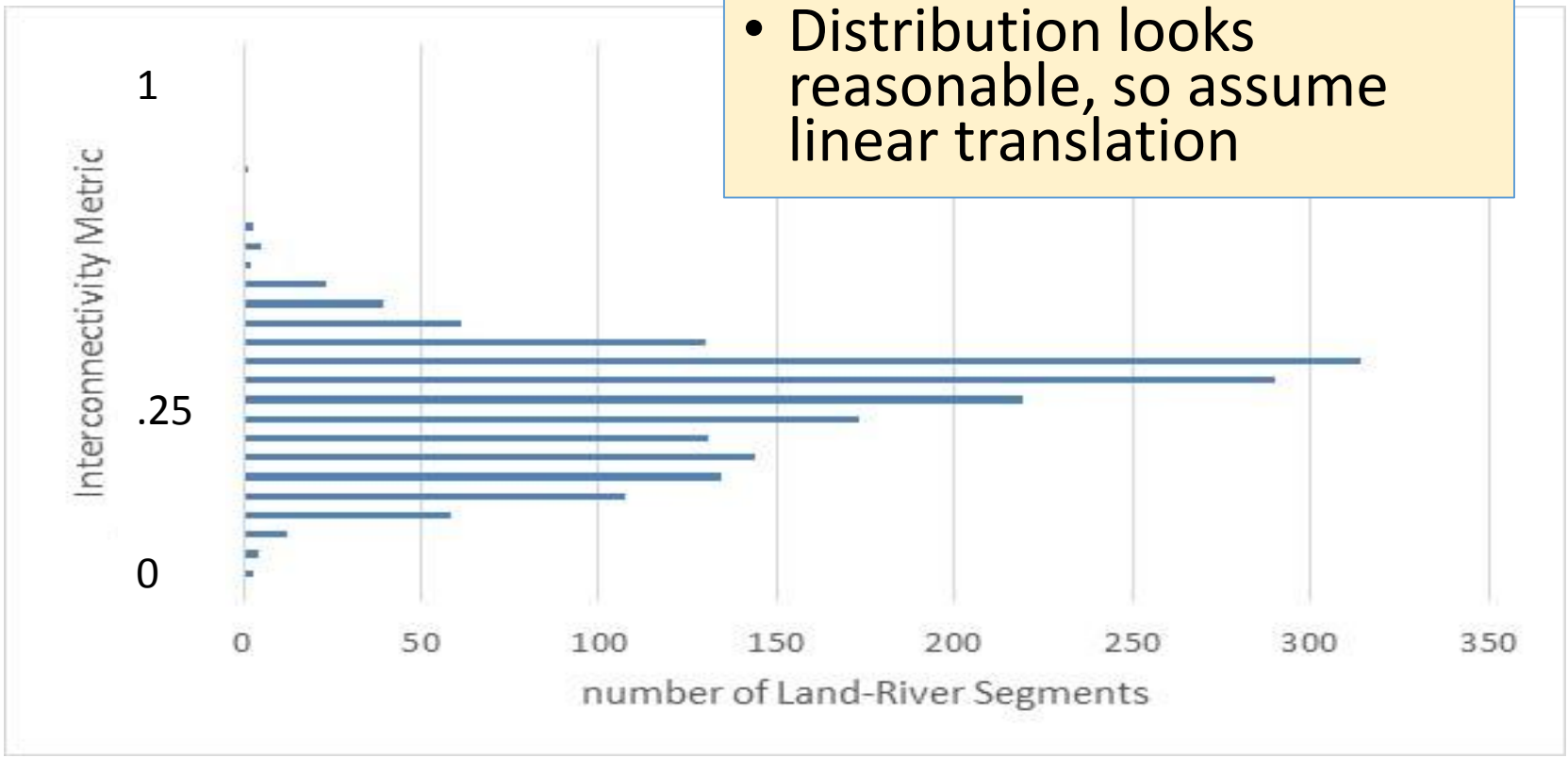
Calculation related to Slope, Area, Flowpath Length, and Roughness

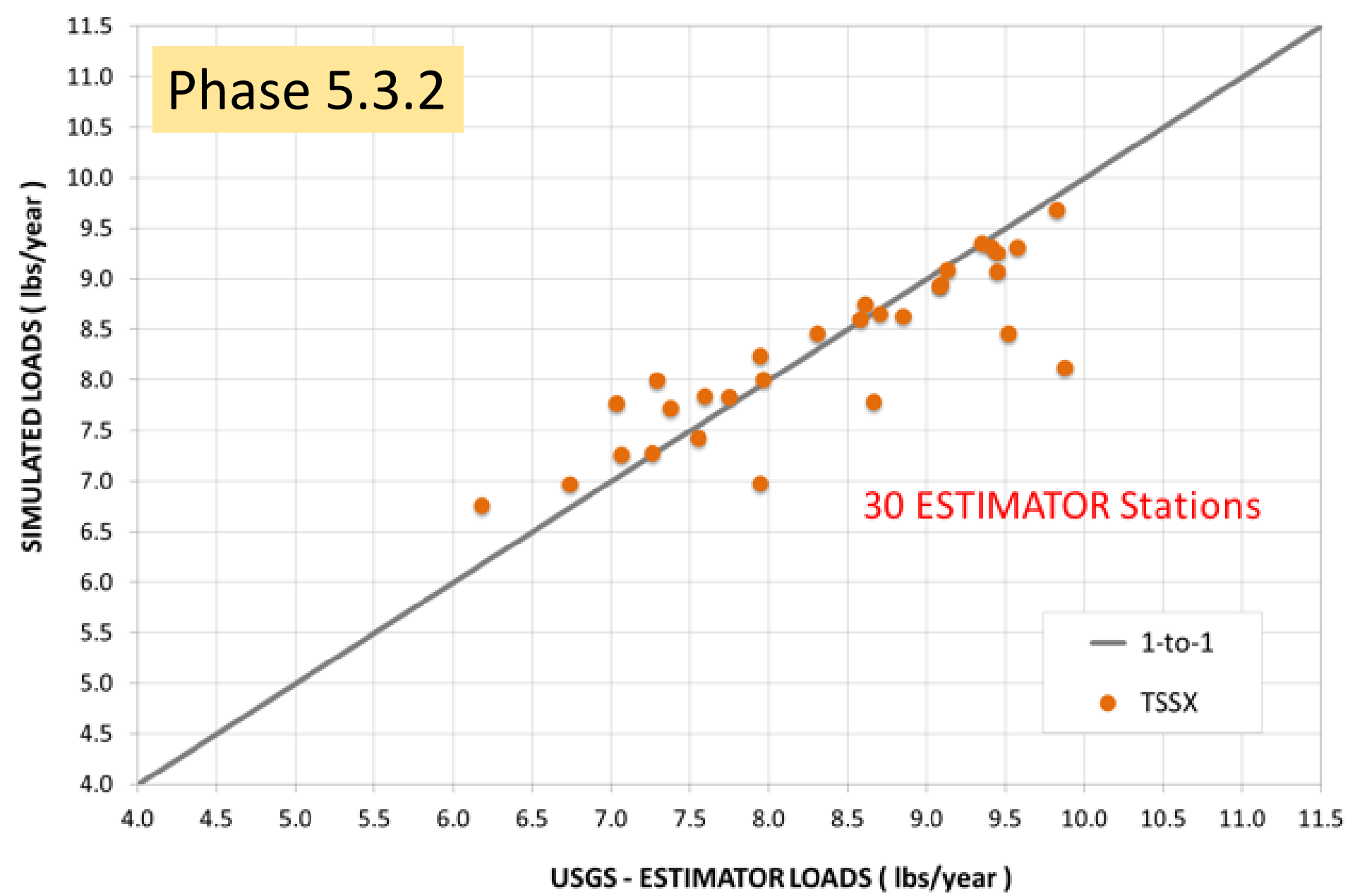


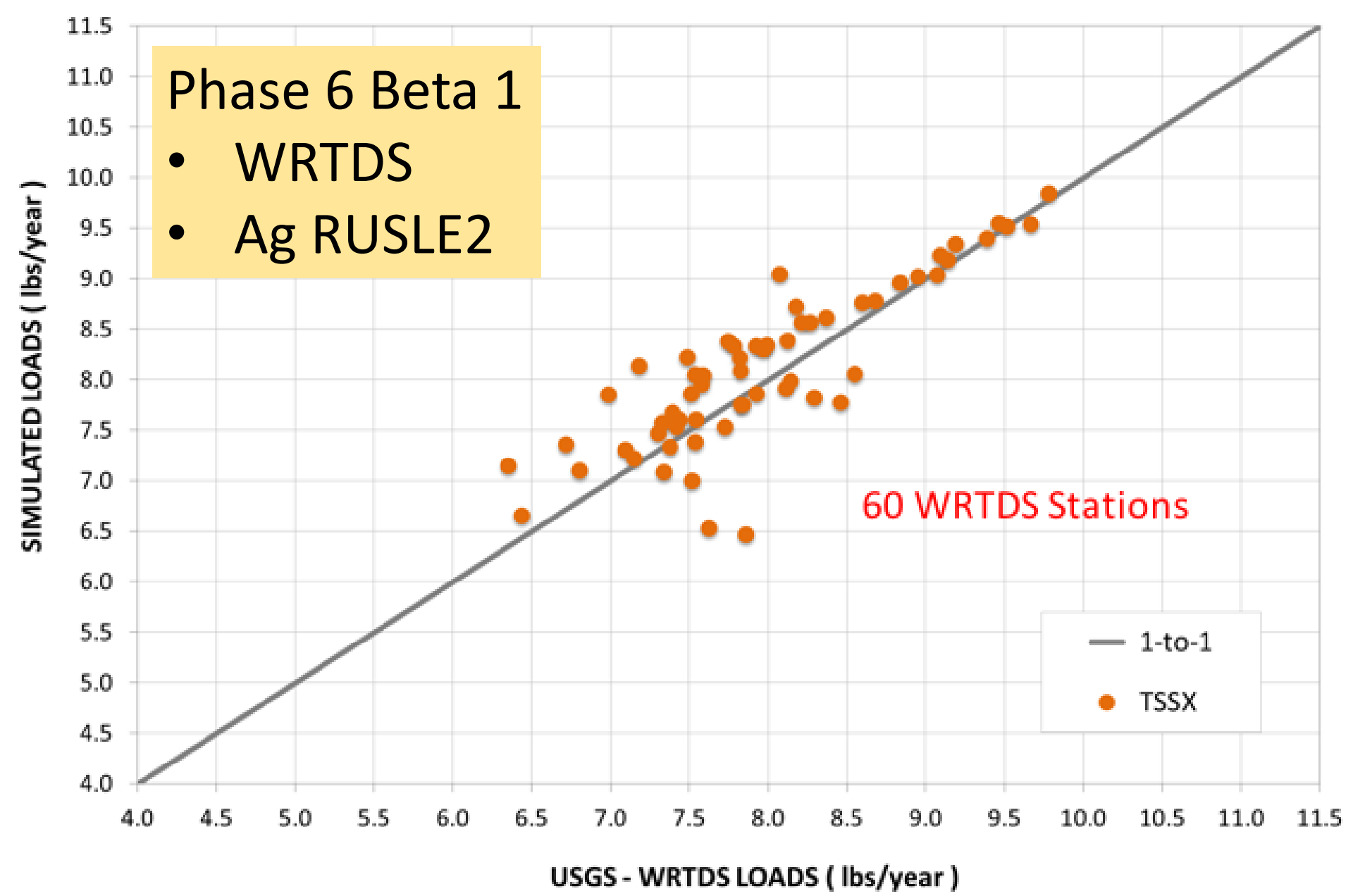
Peter Claggett and David Saavedra (UMBC)

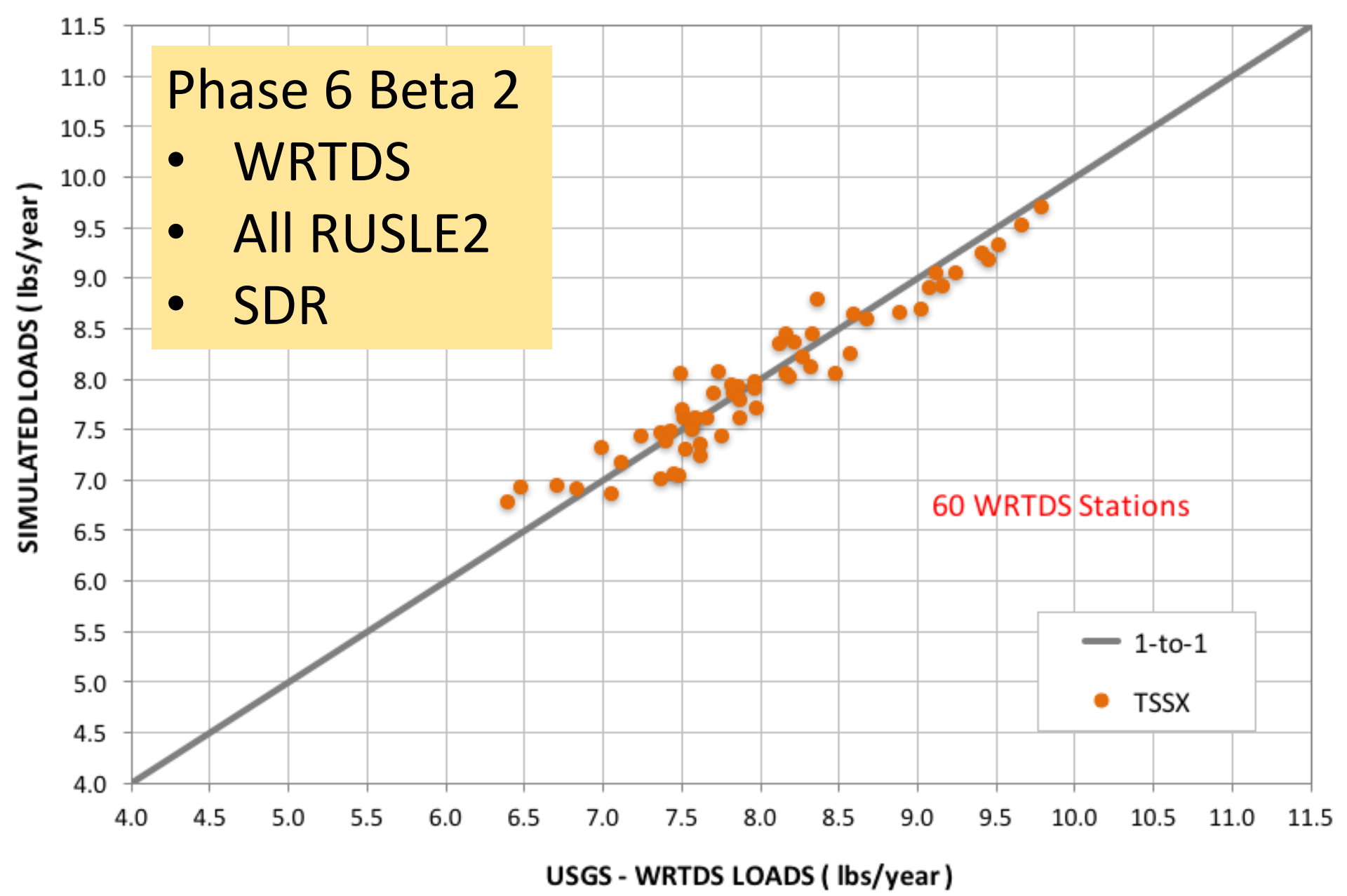
Sediment Delivery Ratio

- Need to convert to scale of 0 to 1 with an average of 0.25
- Distribution looks reasonable, so assume linear translation




Phase 5.3.2
SIMULATED LOADS (lbs/year)
USGS - ESTIMATOR LOADS (lbs/year)
30 ESTIMATOR Stations
1-to-1
TSSX
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0
11.5


Phase 6 Beta 1
• WRTDS
• Ag RUSLE2
60 WRTDS Stations
1-to-1
TSSX
SIMULATED LOADS (lbs/year)
USGS - WRTDS LOADS (lbs/year)
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0
11.5


Phase 6 Beta 2
• WRTDS
• All RUSLE2
• SDR
60 WRTDS Stations
1-to-1
TSSX
SIMULATED LOADS (lbs/year)
USGS - WRTDS LOADS (lbs/year)
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5

Background on Initial RUSLE 2 Runs

- NRCS identified RUSLE experts in each state.
- Experts developed all parameters used in the RUSLE scenarios with the exception of plant and harvest dates.
  - Plant and harvest came from Phase 6 SB. This consistency between the tools was important so planting, uptake, application, nitrogen fixation and harvest occurred in similar timeframes in both the RUSLE analysis and SB.
- Where there were logic differences, rather than crop or management action differences, there were changes made.
  - A crop can be modeled in RUSLE with or without weeds. This was standardized across states for comparability.
- The states determined the crops that were most representative of major categories.
  - Major categories are like corn/wheat/soybean rotations and pasture. The states also selected representative fruit and vegetables-one viney and one bushy.
- The RUSLE scenarios were run without BMPs, including cover crops.
  - When states provided their corn/wheat/soybean rotation, they were told to do so for wheat harvested for grain, not cover crop wheat.