

Soil Conservation Metric: Proposed Revision to Water Erosion Model Component



Approved by Metrics Committee: January 3, 2018

Background

Field to Market sustainability metrics are reviewed and, if necessary, revised once every three years in order to ensure they remain grounded in best available science. In addition, any member can request review of a metric based on advances in models or research that indicate a change may be warranted. In the fall of 2017, the Metrics Committee was advised by NRCS of an upcoming change in their modeling services that could impact Field to Market's Soil Conservation Metric. We have worked with NRCS to determine the best path forward, considering the reason for the change on the side of NRCS, the scientific basis for the different models under consideration, and the implementation considerations of the technology of using the NRCS model services in the Fieldprint Platform. The Metrics Committee heard from NRCS representatives at our November 2017 in-person meeting and an early January 2018 phone call, and reviewed documentation available on the NRCS erosion model services.

Based on the material reviewed and communications with NRCS and the technology team, the Metrics Committee is recommending Field to Market switch from the RUSLE2 (Revised Universal Soil Loss Equation 2)¹ model to the WEPP (Water Erosion Prediction Project)² model to represent water erosion in the Fieldprint Platform. The exact timing of the switch is to be determined by the technology team, consisting of the Field to Market Data and Technology Director, the Fieldprint Platform Developers, and partners at Colorado State University and would occur with or subsequent to the initial release of Fieldprint Platform 3.0. The technology team is best able to consider both the schedule and impact of transition between models at NRCS and the ongoing development schedule for the Fieldprint Platform.

¹ <http://www.ars.usda.gov/Research/docs.htm?docid=6028>

² Flanagan, DC, JE Gilley, TG Franti. 2007. Water Erosion Prediction Project (WEPP): Development History, Model Capabilities and Future Enhancements. Transactions of the ASABE. 50(5):1603-1612.

Current Metric

The Soil Conservation Metric is a measure of soil lost to wind and water erosion processes and was initially adopted into the Fieldprint Platform in 2010. This metric is currently calculated with two erosion models that are developed, maintained and deployed by USDA's Natural Resources Conservation Service (NRCS) – RUSLE2 (Revised Universal Soil Loss Equation 2) and WEPS (Wind Erosion Prediction System). These two models are used extensively by NRCS field office staff for conservation evaluation and programs with growers. RUSLE2 was developed for this purpose – to guide conservation planning – and evolved from previous erosion prediction technologies. It estimates average annual erosion based on site-specific conditions and relies on both user-entered data and existing databases, and a series of mathematical equations³, and was designed to guide and assist erosion-control planning. It is an empirically-based model, meaning certain components are determined by using prior observations, rather than mathematically calculated processes.

Proposed Revision

NRCS is in the process of transitioning from RUSLE2 to WEPP for their conservation programs. WEPP has been under development since 1985 and the scientific basis, code development and model performance are well documented; it has been widely used in other USDA agencies, including the Forest Service and Agricultural Research Service. It is a process based simulation model, and requires more computational time than RUSLE2. WEPP documentation, including a bibliography of published research, is available from USDA ARS⁴.

The advantages of WEPP over RUSLE2 include: greater accuracy for erosion estimates; ability to estimate in-field (gully) erosion; updated weather databases and more agile structure for regular updating of weather files; and more robust simulation of crop growth. In addition to scientific advantages, WEPP relies on the same parameter and weather databases as the WEPS wind erosion module, streamlining NRCS erosion services. NRCS plans to transition from RUSLE2 to WEPP for water erosion in 2018. NRCS has already ceased development and updates to RUSLE2.

The same scientific and practical advantages apply to Field to Market. Adopting WEPP will result in a metric that stays current with the state of the science and technology for erosion

³ RUSLE2 Science Documentation. USDA ARS. August 2013.

https://www.ars.usda.gov/ARSUserFiles/60600505/RUSLE/RUSLE2_Science_Doc.pdf

⁴ <https://www.ars.usda.gov/midwest-area/west-lafayette-in/national-soil-erosion-research/docs/wepp/>

modeling; will better align with our current wind erosion component; and will ensure continued collaboration with and benefits of USDA investment in erosion modeling tools.

Anticipated Timing and User Impact

NRCS is moving to fully deploy WEPP into their erosion model services in the spring of 2018. Field to Market will not make a transition until after NRCS deployment is complete, but the Metrics Committee recommendation is to adopt it as soon after that as is practical.

WEPP requires the same basic data inputs as RUSLE2: soil, climate, and management. Soil data for WEPP comes from the same USDA-NRCS soil database used in the Fieldprint Platform. Climate data comes from a USDA-ARS weather generator representing the nearest climate station to the farm field, adjusted for precipitation and temperature differences between the station and the farm field. Management data comes from the same USDA-NRCS land management and operations (crop rotation) database currently used in the Fieldprint Platform, updated to support WEPP and provide improved parameter sets. With WEPP compared to RUSLE2, Fieldprint Platform user inputs will not change except for the option to change default slope shape and aspect. The Platform is currently undergoing a redesign and the development team will be able to plan for any technical changes due to the adoption of WEPP.

The Soil Conservation Benchmarks for Field to Market are based on USDA simulation modeling at a regional scale, using survey data to produce estimates of average soil erosion rate by state and crop type. Those estimates for the most recent available years (2007 and 2012) are simulated with RUSLE2. Going forward, it is anticipated that the USDA estimates of these regional erosion factors will be generated with WEPP; however, until that happens there will be some discrepancy between methodology for the benchmarks and metrics. Several current research projects are documenting results from direct comparisons between the two models, and Field to Market will use that information to produce any necessary guidance for users on interpretation of the Soil Conservation benchmarks.

Next Steps

This proposed revision to the Soil Conservation Metric will be open for member and public comment from 02/26/2018 to 03/26/2018. Any feedback should be sent to comments@fieldtomarket.org and will be considered by the Field to Market Metrics Committee. Following the comment period and any necessary modifications, the proposal will be presented to the Field to Market Board of Directors for final approval.