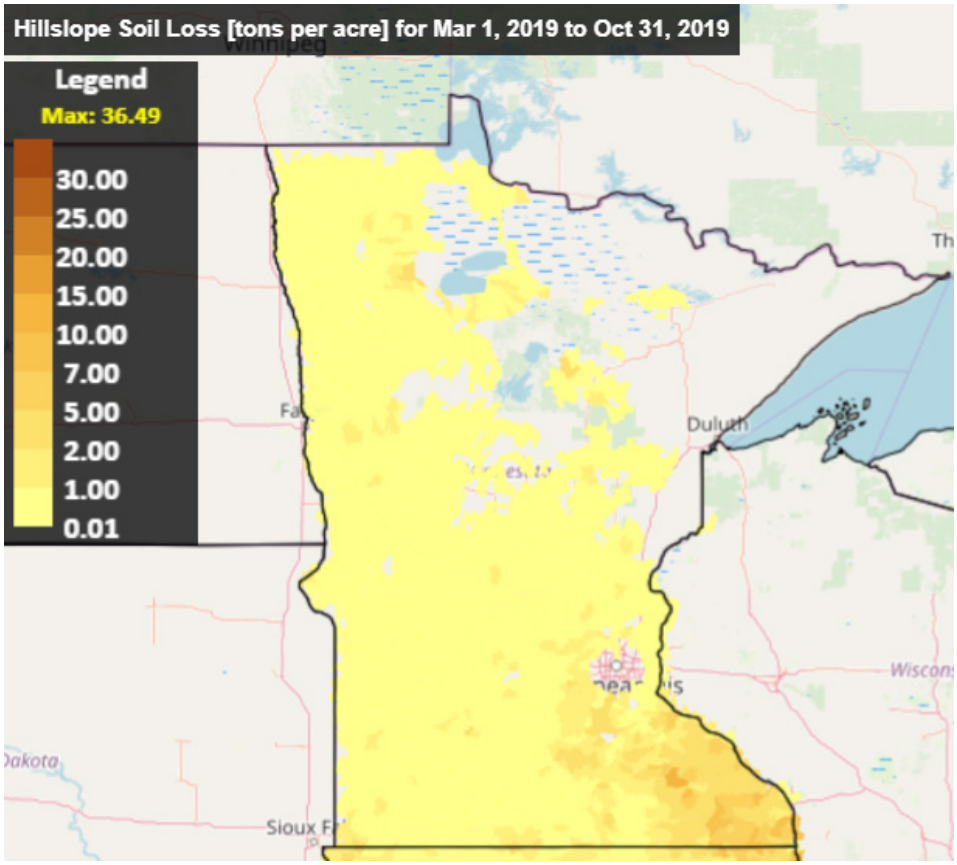
The Daily Erosion Project: A digital approach to soil assessment

Satellite imagery and modeling can save time, money, improve data reliability



The Daily Erosion Project map indicates soil loss in tons per acre during the 2019 growing season.
Map Credit: Daily Erosion Project

Minnesota is home to a diverse landscape of lakes, streams, farmland, forests and urban areas. Soil is the link among each of these types of landscapes. Minnesota has some of the richest soils in the world, which is why the state is a world leader in agricultural production.

To develop the Daily Erosion Project to automate collection of critical data on the status of Minnesota's soils, the Minnesota Board of Water and Soil Resources (BWSR) has partnered with the University of Minnesota's Department of Soil, Water, and Climate plus Iowa State University.

Protecting and conserving soil for future generations is essential to BWSR's mission, and to the mission of its partners such as soil and water conservation districts and the USDA's National Resources Conservation Service (NRCS). Historically, it's been challenging to track soil loss and general soil health data in agricultural landscapes. Monitoring changes in crop residue cover, and cover crop adoption also has proven difficult.

To address that need, in the 1990s BWSR began collecting transect survey data of agricultural tillage methods. While this information helped with planning, it was labor-intensive, subject to human error and unreliable for monitoring trends.

The Daily Erosion project launched in Iowa in 2001, and underwent a major update in 2014 that spurred expansion into surrounding states. In 2016, BWSR led the move to add Minnesota's agricultural counties to the Daily Erosion Project. The Daily Erosion Project models average daily runoff, and soil loss from agricultural fields on a watershed basis. Data can be displayed to show these attributes daily or over longer periods of time. This application provides data to evaluate trends in soil loss at a relatively fine scale of resolution compared with county-based trends provided by the United States Department of Agriculture.

The goal of this approach is to save time, money, and improve data reliability. The project, funded by the Clean Water Fund, uses satellite imagery to better evaluate changes

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in crop residue and assess cover crop adoption across all agricultural regions of Minnesota. These methods are currently being updated and enhanced based on ground truth data collection and analysis. Ground truthing is important to for any model to best represent what is happening out in the field. These residue and cover crop data are important, along with daily rainfall, in providing information to drive the Daily Erosion Project for Minnesota.

"Soil is essential to the livelihood of Minnesotans today as well as in the future. This new tool will help us more accurately and consistently track the conservation of soil across Minnesota," said Matt Drewitz, BWSR measures and outcomes coordinator. "The data generated by the Daily Erosion Project will be one of many important considerations for developing watershed management plans and implementing practices to preserve and conserve our valuable soils in Minnesota."

With an interactive map, the Daily Erosion Project tool lets users explore the data at different scales and develop their own scenarios. This application addresses the soil loss occurring at the field scale level in predominantly agricultural watersheds. The tool doesn't calculate loads of soil or nutrients delivered to a water body; other watershed-based models are used to determine those outcomes.

"The Daily Erosion Project has been an important tool in Iowa to assess changes in soil erosion from a daily to yearly basis. Iowa has used this information to better estimate and manage flood volumes and site conservation projects via the Agriculture Conservation Planning Framework, which will also be beneficial for use in Minnesota." said Brian Gelder, an Iowa State University scientist who co-leads the Daily Erosion Project.

In the next few years, University of Minnesota and Iowa State University staff will work to enhance the Daily Erosion Project application to fit issues unique to Minnesota soil. One of the first major enhancements will add a wind erosion component to provide information about average daily wind speed and soil loss by wind. Another major development will allow assessment of soil loss from forestlands of northwestern and north-central Minnesota. With these enhancements in the works, Minnesota will be better positioned to accurately assess trends in soil cover and soil erosion in order to more effectively protect this important resource and as nearby waterways.

Winona County SWCD Resource Specialist Lance Klessig holds a handful of soil during a 2019 field visit. The Daily Erosion Project uses satellite imagery and modeling to automate collection of critical data on the status of Minnesota's soils. **Photo Credit:** BWSR

"This has been an exciting project for Minnesota, and has been a great opportunity for the University of Minnesota to partner with BWSR to bring new technology to the forefront of this issue," said Dr. David Mulla, University of Minnesota project lead.

Click here to access the application and learn more about erosion data in Minnesota. Follow @dailyerosion on Twitter for daily updates.

For more information about this project, contact BWSR Measures and Outcomes Coordinator Matt Drewitz, or visit BWSR's website.