Operational Tillage Information System

USING REMOTE SENSING DATA TO DRIVE CONSERVATION AGRICULTURE SOLUTIONS

Cereal rye cover crops have been planted into corn on this Iowa farm. © Lynn Betts/NRCS/SWCS

Agriculture's footprint in the U.S. spans all 50 states and accounts for more than half of the U.S. land base—1.2 billion acres, including more than 200 million acres of row crops like corn, soybeans, wheat, cotton and rice. Tillage practices and winter cover crops on these farmlands have a significant impact on productivity and environmental outcomes, including soil erosion, water quality, carbon sequestration and soil health.

A new tool developed by Applied GeoSolutions (AGS) has the potential to unlock conservation solutions for a variety of food and agricultural supply chain stakeholders. The Operational Tillage Information System (OpTIS) is an automated system designed to monitor the yearly usage trends of soil health practices over large agricultural areas. Using publicly available, remote sensing data from multiple satellites, OpTIS monitors the adoption rate of no-till, conservation tillage, and winter cover crops annually in a large-scale, systematic and cost-effective way.

AGS, the Conservation Technology Information Center (CTIC) and The Nature Conservancy (TNC) have spearheaded the development, testing and application of OpTIS. While OpTIS calculations are performed and validated at the farm-field scale using publicly available remotely sensed data, the privacy of all individuals is fully protected by reporting only spatially-aggregated results at larger geographic scales (Crop Reporting Districts and HUC8 watersheds).

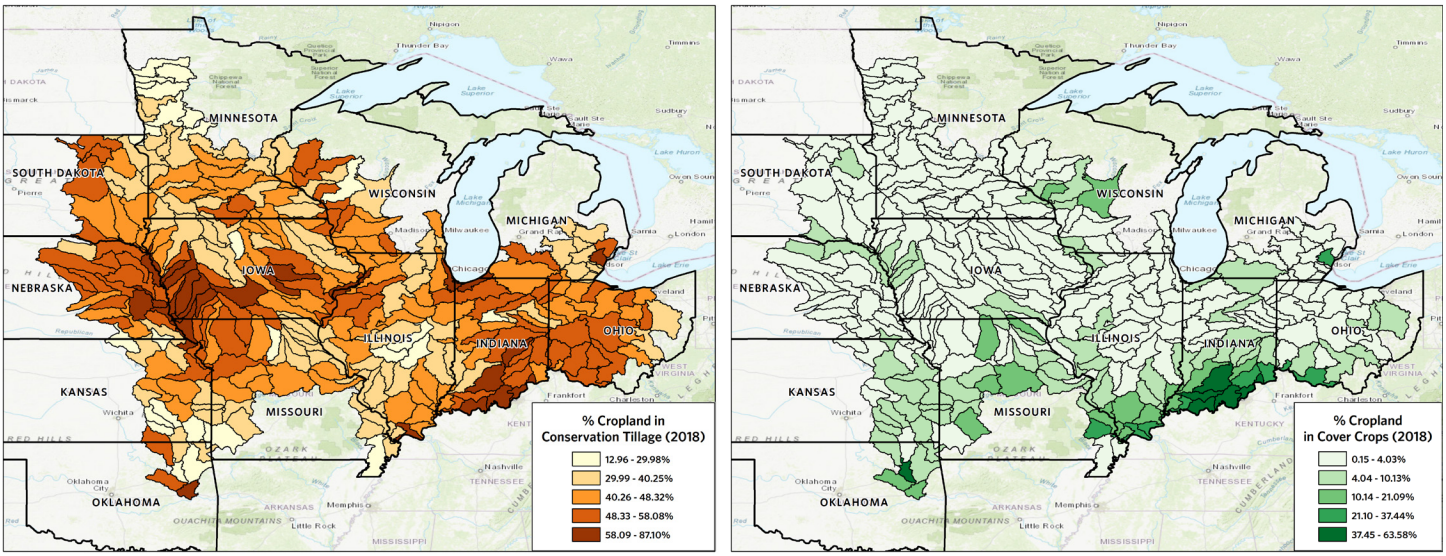
Online queries of OpTIS data—**available freely at ctic.org/OpTIS**—can be customized by timeframe, units, crops and geographic area.

Researchers are also inputting OpTIS data into the DeNitrification-Decomposition (DNDC) computer simulation model to estimate various environmental factors associated with the data trends. Those factors include nitrous oxide emissions, nitrate loss, soil organic carbon, and water-holding capacity. This additional dataset is set for release in Fall 2019.

"Utilizing remote sensing technology that is ground-truthed allows us to see the entire picture of conservation practice adoption, and the results show that we are making progress."

— Ben Gleason,
Sustainable Program Manager,
Iowa Corn Growers Association

Multiple cover crop species help to improve soil health and overall production capacity.
© Ron Nichols, USDA-NRCS



OpTIS analysis revealed an increase of nearly 2 million acres of winter cover crops were planted after soybeans and corn across Corn Belt between 2006 and 2018. During that same time, conservation tillage across the region remained relatively steady in corn and soybeans, averaging 44.4 percent (54.2 million acres) in 2018. (Maps provided by TNC)

Data Reveals Conservation Practices Steadily Increasing

OpTIS data released in August 2019 document the level of adoption of soil health practices across the Corn Belt—an area extending from eastern Ohio to eastern Kansas and Nebraska, and from the Missouri Bootheel to the Red River Valley of North Dakota—from 2005 to 2018. This data set represents about 1.8 billion acre-years of agricultural conservation practices. The data show:

- Adoption of winter cover crops—non-cash crops growing over the winter—is increasing. Across the Corn Belt, cover crops planted after corn and soy increased by nearly 2 million acres between 2006 and 2018. Specifically, cover crop use went from 1.7 percent (2.03 million acres) to 3.2 percent (3.94 million acres) of usage in the Corn Belt.

  The increased usage of cover crops was limited during the first half of this monitoring period (through 2012), but the level of adoption accelerated in recent years across the region.

  While the total number of acres in cover crops may be low, the rate of adoption is positive. Based on OpTIS data from 2006 to 2018, scientists anticipate that cover crop adoption after corn and soy harvests will be around 4.5% (5.4 million acres) within the next 5 years across the Corn Belt.

- Conservation tillage practices—those that leave at least 30 percent of residue on the surface before planting—have remained relatively steady for corn and soybeans, averaging 44.4 percent (54.2 million acres) across the Corn Belt in 2018 and 45.5 percent (55.1 million acres) in 2006.

Benefits for Conservation and Business Stakeholders

OpTIS and DNDC data will fill critical gaps in understanding recent trends in conservation practices and soil health, as well as set a baseline of adoption against which future progress can be tracked. These data will enable a more targeted focus of resources and tools to help farmers secure their future while benefiting communities and nature. A range of public and private stakeholders can use the data for a multitude of purposes, including:

- Tracking progress in meeting conservation goals
- Targeting technical service or incentive programs
- Comparing the success of conservation programs across large areas
- Advancing ecosystem services markets

Funding for the OpTIS data release covering the Corn Belt includes grants from the Foundation for Food and Agriculture Research, the U.S. Department of Agriculture, Bayer Crop Science, Corteva Agriscience, Enterprise Rent-A-Car Foundation, J.R. Simplot Company, The Mosaic Company, Syngenta, the Walmart Foundation and The Nature Conservancy.

OpTIS Benefits People and Nature

OpTIS data show soil health adoption rates are moving in the right direction, and it gives the conservation and ag communities a vital tool to help farmers continue—*and accelerate*—the upward trend.

Soil health practices help to improve crop productivity, reduce soil erosion, improve water quality and increase soil carbon storage.

In fact, improving soil management practices on U.S. croplands has the potential to mitigate 25 million metric tons of greenhouse gas emissions. That's the equivalent to taking 5 million passenger cars off the road for one year.

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