OpTIS
Operational Tillage Information System
Using Remote Sensing Data to Map Conservation Ag Practices
Project Partners

Applied GeoSolutions (AGS)
  ◦ Steve Hagen & Bill Salas

Conservation Technology Information Center (CTIC)
  ◦ Dave Gustafson

The Nature Conservancy (TNC)
  ◦ Pipa Elias
OpTIS: Multiple Past & Current Co-Sponsors
Outline

What is OpTIS?
Possible applications
Phase 1 Data Release
Phase 2 Plans
OpTIS: What is it?

Technology from Applied GeoSolutions

Uses publicly-available remote sensing data to map & monitor adoption of tillage practices and cover crops

Unlike CRM, OpTIS data are “longitudinal,” making multi-year products possible (e.g. include crop rotation overlays, etc.)

Calculations at field-scale (30 m), but released only at HUC8 and CRD geographic scales (grower privacy fully respected)

Data freely available at ctic.org/OpTIS
OpTIS Data: Details

<table>
<thead>
<tr>
<th>Tillage categories</th>
<th>Residue cover levels</th>
<th>Winter cover types</th>
<th>Soil Health metrics</th>
<th>DNDC estimates</th>
<th>Years: 2005-2018</th>
<th>Publication plans</th>
<th>Comparison with other estimation methods underway</th>
</tr>
</thead>
</table>

*CRM Survey Data (Legacy)*

<table>
<thead>
<tr>
<th>Residue Level</th>
<th>No-Till</th>
<th>Ridge-Till</th>
<th>Mulch Till</th>
<th>Reduced Tillage (low residue)</th>
<th>Conventional Tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residue Level</td>
<td>&gt;30%</td>
<td></td>
<td></td>
<td>15-30%</td>
<td>&lt;15%</td>
</tr>
</tbody>
</table>

*NRCS (approximate)*

<table>
<thead>
<tr>
<th>Residue Level</th>
<th>No-Till</th>
<th>Ridge-Till</th>
<th>Mulch Till</th>
<th>Reduced Tillage (low residue)</th>
<th>Conventional Tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRCS</td>
<td>329</td>
<td>345</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*OpTIS*

<table>
<thead>
<tr>
<th>Residue Level</th>
<th>No-Till</th>
<th>Reduced Tillage (Corn)</th>
<th>No-Till (other crops)</th>
<th>Reduced Tillage (low residue)</th>
<th>Conventional Tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residue Level</td>
<td>&gt;50%</td>
<td>30-50%</td>
<td>15-30%</td>
<td></td>
<td>&lt;15%</td>
</tr>
</tbody>
</table>

*NRCS (approximate)*

<table>
<thead>
<tr>
<th>Residue Level</th>
<th>No-Till</th>
<th>Ridge-Till</th>
<th>Mulch Till</th>
<th>Reduced Tillage (low residue)</th>
<th>Conventional Tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRCS</td>
<td>329</td>
<td>345</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data reported by previous year’s crop (corn, soy, small-grain, other)
Land not planted to row crops (e.g. pasture) is excluded

www.ctic.org
OpTIS: Soil Health Metrics

Five-year moving window

Select area having at least \( X \) unique commodity crops AND at least \( Y \) years of winter cover AND at least \( Z \) years of conservation tillage – over 5 years
OpTIS: Possible Applications

Phase 1 Release is >1 Billion Acre-Years of Data
Measure Soil Health baselines and trends
Input to Water Quality models (local and basin-scale)
Input to Biogeochemical models (e.g. DayCent, DNDC, etc.) to estimate GHG emissions, Soil Carbon, Nitrate losses ...
Target Conservation efforts
Provide verification data for Ecosystem Services Markets
And many others … (e.g. Biodiversity, etc.)
Outline

What is OpTIS?
Possible applications
Phase 1 Data Release
Phase 2 Plans
Phase 1 Data Schedule

OpTIS tillage, winter cover, and soil health metrics:
- **Illinois, Indiana, Iowa** – Released July 16
- **Remaining Corn Belt** – End July

DNDC modeling results – $N_2O$, SOC, Nitrates, Soil Moisture Holding Capacity:
- **End August**
Current OpTIS Data: HUC8 Scale

% CROPLAND IN CONSERVATION TILLAGE (2018)
- 19.75 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 60%
- 60 - 74.84%

% CROPLAND IN COVER CROPS (2018)
- 0.19 - 3.00%
- 3.00 - 6.72%
- 6.72 - 10.77%
- 10.77 - 25.03%
- 25.03 - 63.58%
I-State Conservation Tillage Trends (CRM & OpTIS Data)
I-State Cover Crop Trends (AgCensus & OpTIS Data)
Cover Crops:

Moderate correlation between OpTIS and NASS ($R^2 = 0.5$)

24.1 million acres analyzed in Iowa

Acres in cover crops:
- NASS – 973,000 acres
- OpTIS – 846,000 acres
Conservation Tillage:

Moderate to high correlation between OpTIS & NASS ($R^2 = 0.6$)

24.1 million acres analyzed in Iowa

Acres in con-till:
- NASS – 8.2 million
- OpTIS – 7.1 million
Phase 2 Plans

Add key geographies outside Corn Belt (e.g. Chesapeake, Mississippi Delta, Far West, Great Plains, Southeast, etc.)

Annual updates for 2019 and beyond

Partner more extensively with States

Fund via new Public-Private Partnership, consider direct involvement of USG entities with higher resolution data
Questions?
THANK YOU!

Pipa Elias  
ipa.elias@tnc.org  
571-354-9654

Dave Gustafson  
gustafson@ctic.org  
314-409-7123

Steve Hagen  
shagen@daganinc.com  
603-292-1189
Back-up Slides
Field Data Comparison

• Validation/comparison with Field observations (~500 in Iowa) – Preliminary Results
  • Residue cover – $R^2$ of 0.42
  • Winter cover - 89% agreement, 0.678 Kappa – preliminary

• Cereal rye cover crop example from 2018 in Howard County, IA

Green areas are identified as winter cover by OpTIS

DOY 119 2017

DOY 131 2017