USDA-NRCS Palouse Soil Carbon Project

The Earth Partners, LP
Applied Ecological Services, Inc.
Background

• Applied Ecological Services and The Earth Partners LP received a USDA-NRCS Conservation Innovation Grant

• Objective is to develop a large-scale agricultural carbon project in the Palouse region

• Shepherd’s Grain partnership with over 30 producers over past two years implementing on-the-ground science

• One of the largest land-based carbon projects in the US receiving significant attention from USDA-NRCS, policy makers, and carbon investors
About us

The Earth Partners LP
- Project development and financing to restore land of large areas
- Soil scientists, engineers, finance professionals, and bioenergy developers
- Specialty in creating methods to measure, monitor, and validate environmental assets like carbon and water over landscape-scales

Applied Ecological Services (AES)
- One of the largest ecological restoration firm since 1975
- Over 200 technical and restoration and research staff in 9 offices, working on >700 projects annually in agricultural lands, grasslands, savannas, and many other ecosystems
- Owner/operator of one of the largest native plant nurseries in the USA and elsewhere
Carbon and GHG cycle

**Sources of emissions**

- Soil disturbances from tillage
- Soil erosion from weather, mgmt practices
- Nitrous oxide from fertilizer

**Sources of soil carbon**

- Photosynthesis of plants as root matter dies annually
- Reduced soil erosion
- Precipitation as carbonic acid builds inorganic carbon soil

**Results**

**Practices to regrow soil carbon / organic matter**
- Direct seed / reduced till
- Crop rotation/ cover crops
- Nitrogen management (biotic fertilizers, nitrogen inhibitors, 4Rs – right source, place, timing and amount)

**Benefits of increased soil carbon / organic matter**
- Improved long-term yields
- Increased soil fertility
- Reduced erosion
- Water retention and efficiency
- Lower operational costs
- Long term land value
Major goals of the project

• Measure and quantify soil carbon levels through rigorous scientific process

• Aggregate landowners and develop a large-scale project

• Monetize carbon credits in the market when markets develop or buyers emerge

• Add value to the sustainable agriculture practices of Palouse producers

• Influence agricultural policy to reward producers for their sustainable practices

Soil sampling, Whitman County
The Earth Partners developed a method to measure and monitor carbon stocks in agricultural systems.

Peer-reviewed by leading scientists and is validated by the Verified Carbon Standard (VCS).

Allows producers to claim carbon from their management practices based on direct measurement — not restricted by historical research.
The method is built on modules

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<tr>
<th>Module</th>
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- Selection of sub-sets of applicable modules as determined by project characteristics
- Each module stands alone, containing detailed instructions, definitions, tailored catalogue, etc.
How carbon assets are created

Carbon and GHG balance, Tons of CO$_2$e

- Loss of CO$_2$e
- Gain of CO$_2$e
- Measurements over crediting period according to TEP methodology
- Asset is the difference between actual measured CO$_2$e levels and the baseline projection
- Baseline scenario projection (assuming business-as-usual)

- Project scenario projections made at the beginning (assuming implementation)
In Fall/Winter 2011, the team engaged in pre-sampling and mapping and stratification of the landscape.

In Spring 2012, the team implemented a sampling plan that collected over seven hundred 1-meter depth soil cores from conventional and direct seed acreage across the landscape.

In Fall 2012, the University of Missouri Soils Lab tested bulk density and soil carbon on all cores, as well as pH, nitrogen and a suite of other soil tests on a subset of soil cores.

In Winter 2013, team statisticians analyzing results to develop science-based projections for current and future carbon levels across the Palouse.
Mapping/stratifying the landscape

Over 7 million acres stratified

- Incorporating results of pre-sampling
- Integrating variables like Elevation, Precipitation, Soil Type
Sample Allocation
### Sample Locations by Strata

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**Pre-Allocated or Sampled Plots:**
- P2: 12
- P3: 81
- P4: 80
- P5: 73
- P6: 100
- P2: 100
- P3: 100
- P4: 100
- P5: 84
- P6: 84
- P2: 52
- P3: 52
- P4: 100
- P5: 101
- P6: 8
- Total: 109
The actual sampling
Number of Cores and Samples Collected
608 sampled locations +
102 total duplicates
710 cores total, 2062 lab samples (~3/core)

Samples by type
H1 – Conventional (81 samples)
H2 – 1-5 yrs No-till (73 samples)
H3 – 6-12 yrs No-till (100 samples)
H4 – 13-20 yrs No-till (84 samples)
H5 – 21+ yrs No-till (52 samples)
H6 – CRP (101 samples)
H7 – Misc/Irrigated (8 samples)
H9 – Reference Area (109 samples)

Then further allocated by several strata categories:
slope position, aspect, precipitation zone, etc.

Soils Lab Analysis
• Core description & splitting by horizon
• Course Fragments
• Bulk Density
• % Organic Carbon
• % Inorganic Carbon
• % Total Carbon
Preliminary findings

- 34% of the variability of sample results is accounted for by collected data

- Greater amount of carbon in wetter precipitation zones and lower slope positions

- Increased number of years of no-till is associated with more soil organic carbon in upper A horizon, even accounting for precipitation and slope position.

- Many instances of deeply buried carbon in the landscape, and accruals at deep levels
What this can mean for a producer

**Basecase average**
- 6.1 kg/m² of carbon in topsoil
- 27.1 tons of carbon/acre in topsoil
- 99.5 tons CO₂e/acre
- 496,953 tons CO₂e on 5,000 acres

**Example from an average 5,000 ac farm, tons CO₂e**

- Prediction range within 95% confidence
- Mid is 13% increase in carbon (66,000 credits)

1.5-2x more available with Nitrogen management
How the program works

• Producer signs enrollment agreement outlining process and economics
• Carbon is measured and verified through The Earth Partners’ Methodology
• Increases in soil carbon are documented and converted into equivalent “verified” carbon credits
• When and if carbon markets develop or buyers emerge, producer already owns these “verified” carbon credits
• The Earth Partners markets the credits, and producer chooses when to sell the credits, and at what price

This project allows producers to begin “banking” their carbon
How to join the program

• Let us know if you are interested in participating (sign the information form)
• We’ll provide you with the Enrollment Agreement to review
• We’ll need an FSA Data Release form for the farms where you are listed with FSA as the producer (not necessarily the owner)
• We’ll follow up to learn about the practices in each field
• We’ll then engage you about the enrollment process and next steps
• USDA-NRCS has EQIP funds allocated specifically to support the Greenhouse Gas (GHG) Conservation Innovation Grant (CIG) projects, of which our project is one of six
• Producers practicing no-till and participating in this program are eligible for these EQIP dollars
• EQIP Practices must be core soil carbon practices, including:
  o Residue Management, Seasonal (344)
  o Residue and Tillage Management, Mulch Till (345)
  o Mulching (484)
  o Cover Crop (340)
  o Conservation Crop Rotation (328)
• Application deadlines will be coming quickly in mid- to late-February, so contact your local NRCS office now
• Chas Taylor (chas.taylor@teplp.com)

• Ry Thompson (ry.thompson@appliedeco.com)