Enriching Soil, Enhancing Life
AN ACTION PLAN FOR SOIL HEALTH

1. Research
2. Measurements
3. Economics
4. Communications & Education
5. Policy
2014 Farm Bill

“We build unique partnerships to support innovative science addressing today’s food and agriculture challenges.”

Several Challenge Areas: e.g., Healthy Soils, Thriving Farms
Assessing & Expanding Soil Health for Productivity, Economic, and Environmental Benefits

NEW KNOWLEDGE NEEDED
• Develop reliable soil health indicators related to productivity, economic, & environmental outcomes
• Provide visible proof of relationships among indicators, soil health-promoting practices, & on-farm outcomes & impacts
• Develop information & tools needed by non-operator landowners

NEW KNOWLEDGE YIELDS ACTIONS & OUTCOMES
• Obj. A: Test indicators on long-term research facilities
• Obj. B: Validate indicators on working farms
• Obj. C: Educate & provide tools for landowner

GOAL
Over 50% of farms employ soil-health promoting practices by 2025 because soil health can be measured, the benefits have been demonstrated, and landowners are engaged.

Proposal creates & delivers knowledge
Goal drives knowledge needs
Outcomes drive Goal achievement

GOAL
Practitioners use science-based, community-accepted measurements with confidence
Real-world evidence drives on-farm acceptance
Landowners access & utilize information & approaches they need for implementation decision making
PROJECT: Assessing & Expanding Soil Health for Productivity, Economic, and Environmental Benefits

Funding: Foundation for Food & Agriculture Research

$9.44 M to:
Soil Health Institute, Soil Health Partnership, The Nature Conservancy

SHI Objective: Develop soil health measurements that relate soil health to yield, economic, and environmental outcomes. (Across North America)
Soil Health Measurements: Situation Analysis

- Chemical & Physical Well-Established (“Tier 1”)
- Many Biological Measures, but Limited Evaluation (“Tier 2-3”)
- Several Promising Evaluation Programs Exist - Need Testing and Scaling-Up
- None Adequately Relate Soil Health to Drivers of Adoption:
  – Yield, Economics, Ecosystem Services
- Variations in Soils, Climate, Management, Production System Influence Interpretation
- Strategic, Nationally-Coordinated Approach Required
GREENHOUSE gas REDUCTION through AGRICULTURAL CARBON ENHANCEMENT network (GRACEnet)
DOMINANT SOIL ORDERS

COMBINED LONG-TERM RESEARCH SITES
<table>
<thead>
<tr>
<th>Chemical/Biological:</th>
<th>Physical:</th>
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<tbody>
<tr>
<td>pH</td>
<td>Particle Size</td>
</tr>
<tr>
<td>EC</td>
<td>Bulk Density</td>
</tr>
<tr>
<td>CEC</td>
<td>Aggregate Stability</td>
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<tr>
<td>TN, Extractable P, K</td>
<td>AWHC</td>
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<tr>
<td>Base Saturation</td>
<td>Penetration Resistance</td>
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<tr>
<td>Ca, Mg, S, Fe, Zn, Mn, Na</td>
<td>Infiltration Rate</td>
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<tr>
<td>OC</td>
<td>Erosion</td>
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<tr>
<td>Short-term Cmin, Nmin</td>
<td>Crop Yield</td>
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</tbody>
</table>
Tier 2 & 3 Metrics

B-Glucosidase, B-Glucoasaminidase, Phosphatase, Arylsulfatase
Soil Protein Index
Active C
PLFA, EL-FAME
DNA Sequencing, Proteomics
Reflectance
Aggregate Size Distribution
(+ SMAF, Cornell, Haney)
Recent Progress:
- Developed GIS of long-term agricultural research sites for evaluating soil health measurements in U.S., Canada, & MX
- Blue Ribbon Panel selected methods for all measurements to be evaluated

Next Steps:
- Issue RFP for Long-Term Research Site engagement
- Issue RFP/award contract for soil health laboratory analyses
- Advertise/Fill 7 Project Scientist positions, positioned across N. America
- Hold Regional Planning Workshops across N. America
- Sample long-term sites in 2019
Thank You!

soilhealthinstitute.org
INTEGRATION OPPORTUNITIES

**OBJ. A** – EVALUATING SH MEASURES ON LONG-TERM SITES (10+ YRS)
- SOME DYNAMIC SOIL PROPERTIES RESPOND MORE QUICKLY

**OBJ. B** – SHP SOILS ANALYZED FOR THE MANY OF THE SAME SH MEASURES

**OBJ. C** – SH MEASURES CAN GUIDE NON-OPERATING LANDOWNERS INTERESTED IN IMPROVING SH
INTEGRATION OPPORTUNITIES

OBJ. A – EVALUATING SH MEASURES ON LONG-TERM SITES (10+ YRS)

OBJ. B – SHP FARMERS INTERVIEWED TO ASSESS THEIR ON-FARM EXPERIENCES (YIELD, ECONOMICS) AND VALUE OF SH MEASURES

SERVES AS FEEDBACK FOR INFORMING DESIGN OF COMMUNICATIONS IN OBJ. C

OBJ. C – VALUATION OF SH CAN MOTIVATE NON-OPERATING LANDOWNERS TO WORK WITH GROWERS ON IMPROVING SH
INTEGRATION OPPORTUNITIES

**OBJ.A** – EVALUATING SH MEASURES ON LONG-TERM SITES (10+ YRS)

**OBJ. B** – SHP FARMERS INTERVIEWS INCORPORATE SYSTEMS PERSPECTIVE (WEEDS, NUTRIENTS, INSECTS, CASH FLOW,...)
INTEGRATION OPPORTUNITIES

**OBJ. A** – RESULTS EVALUATING SH MEASURES ON ECOSYSTEM SERVICES, YIELD, ECONOMICS FROM LONG-TERM SITES (10+ YRS)

INTEGRATES WITH REAL WORLD FARMER EXPERIENCES IMPLEMENTING THOSE PRACTICES/SYSTEMS IN **OBJ. B**

BOTH INFORM DEVELOPMENT OF COMMUNICATIONS, MESSAGING, & EDUCATIONAL MATERIALS IN **OBJ. C** TO DEMONSTRATES THE ON- AND OFF-FARM BENEFITS OF IMPROVED SH
Soil Health Measurements
Mission

Safeguard and enhance the vitality and productivity of soil through scientific research and advancement
Roles of the Institute

- Identify research & adoption gaps
- Build research/implementation strategies and corresponding networks/synergies
- Obtain funding to strategically address gaps
- Administer accountable, transparent, and technically proficient grants program
- Ensure impact of investments
- Incorporate research results into educational materials
- Enhance partnerships to increase tech transfer and adoption