Strategic Approach for Evaluating Soil Health Indicators

Paul W. Tracy, Ph.D.

SOIL HEALTH INSTITUTE

SOIL HEALTH INSTITUTE

Mission

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


SOIL HEALTH:
The capacity of a soil to function as a vital, living ecosystem that sustains plants, animals, and humans.

PROJECT: Assessing & Expanding Soil Health for Productivity, Economic, and Environmental Benefits

Funding: General Mills - $2M; FFAR - $9.94M; Others

- 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 N. America)

Soil Health Indicators: 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

APPROACH:

Evaluate soil health indicators on long-term agricultural research sites

PROGRESS TO DATE

Tier 1 Soil Health Indicators Identified

Chemical/Biological Lab

pH
Electrical Conductivity
Cation Exchange Capacity
Total Nitrogen
Extractable Phosphorus
Extractable Potassium
Percent Base Saturation
Sec./Micro. (Ca, Mg, S, Fe, Zn, Cu, Mn)
Organic Carbon
Short-Term C Mineralization
Nitrogen Mineralization

Physical Lab/Field

Particle Size
Bulk Density
Water Stable Aggregation
Available Water Holding Capacity
Crop Yield
Erosion Rating
Penetration Resistance
Infiltration Rate

Tier 2 & 3 Soil Health Indicators Identified

Sodium Adsorption Ratio

Enzymes: B-Glucosidase, B-Glucosaminidase, Phosphatase, Arylsulfatase

Soil Protein Index – Autoclave Citrate Extractable

Active Carbon – Permanganate Oxidizable C

Phospholipid Fatty Acid (PLFA)

Ester-Linked Fatty Acid Methyl Ester (EL-FAME)

Genomics

Reflectance

Soil Health Index Programs to be Evaluated

SMAF – Soil Management Assessment Framework

CASH – Cornell's Comprehensive Assessment of Soil Health

Haney Test

- Hired Project Manager
- Blue Ribbon Panel identified methods for all 31 measurements to be evaluated

Request for Applications

Secure https://soilhealthinstitute.org/request-for-applications/

Apps | New Tab | Think Tank | The WFF Online Gran | Soil Health Research | White Mountain Hea | Altus | Other bookmarks

Soil Health Institute (SHI) Requests Applications to Participate in a North American Soil Health Measurement Evaluation Project:

1. Join the GIS-Referenced Database on Long-Term Agricultural Experiments
2. Participate in the North American Soil Health Measurement Evaluation Project

Submission Deadline: June 29, 2018

Submit requests through the Institute website: https://soilhealthinstitute.org/long-term-agricultural-experiments-directory-project/

Send Questions to: Paul W. Tracy, Project Manager, ptracy@soilhealthinstitute.org

or

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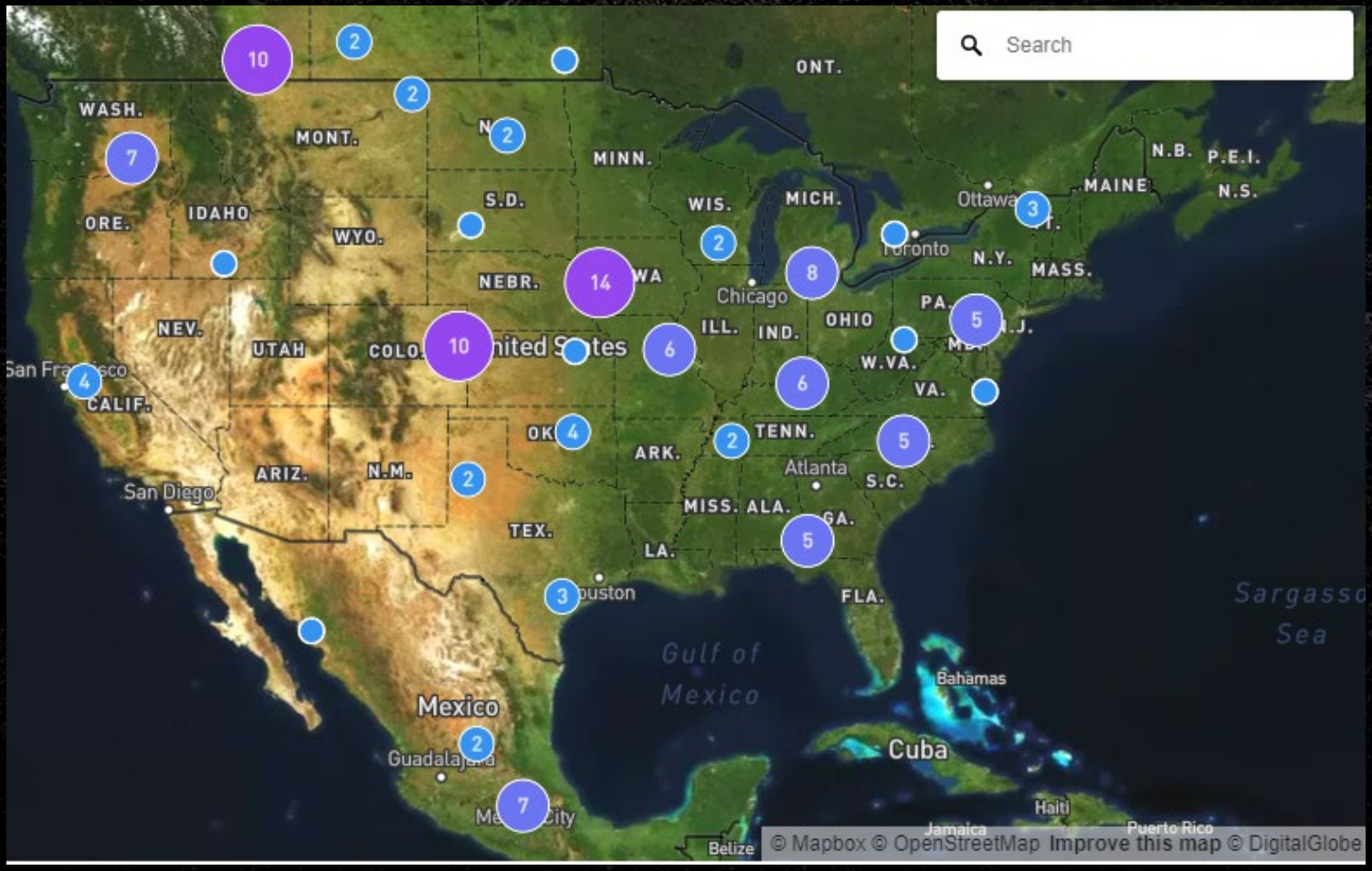
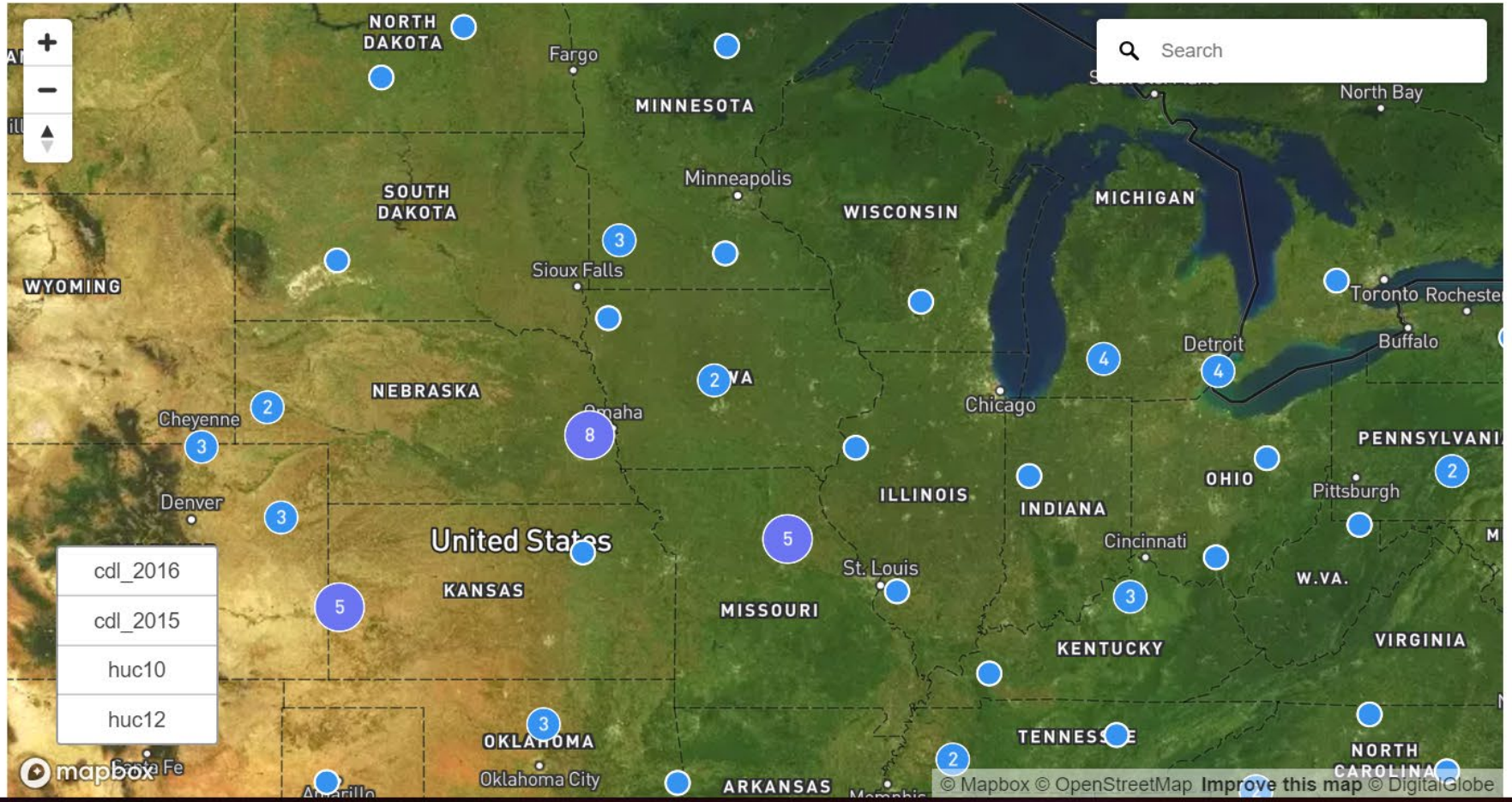
Developed GIS of Long-Term Research Sites (154; 12-6, 2018)

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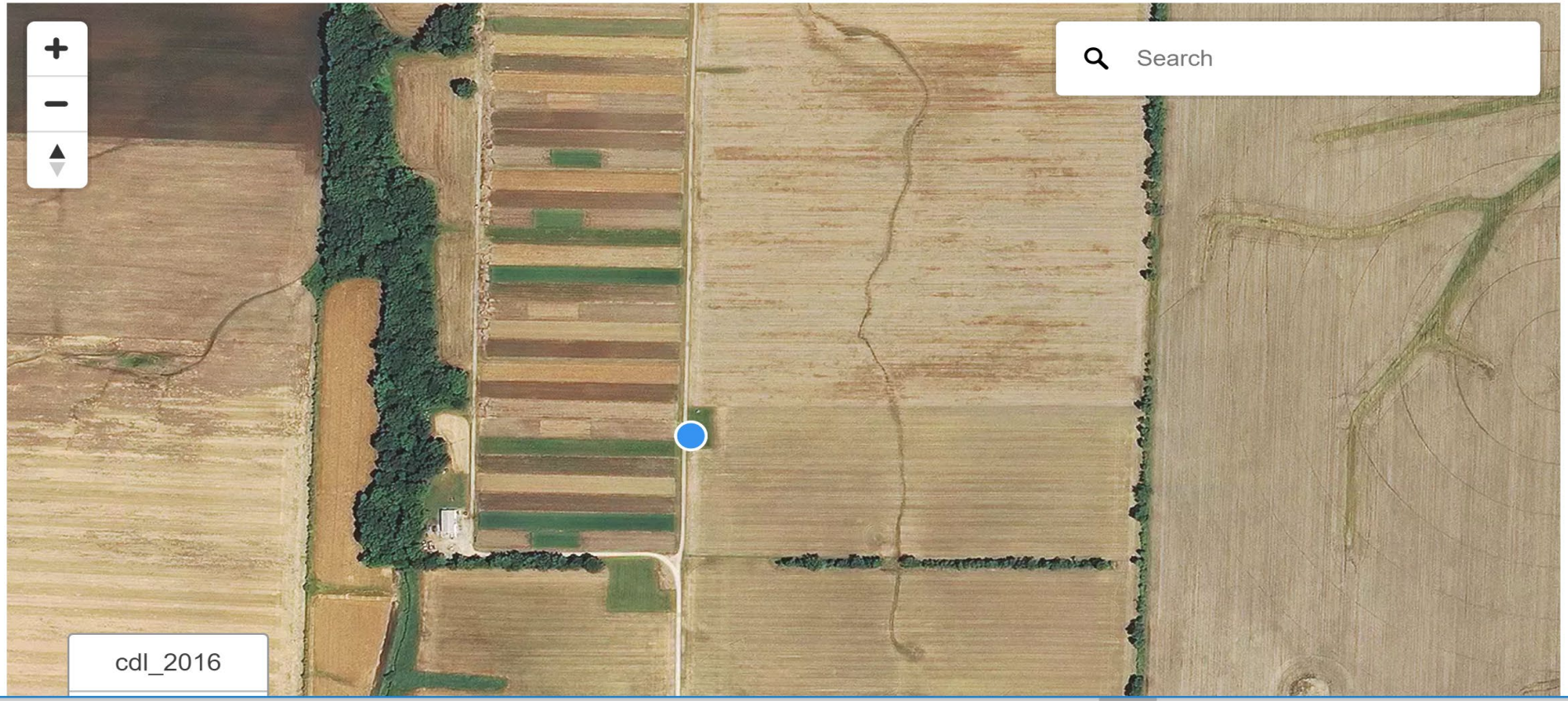

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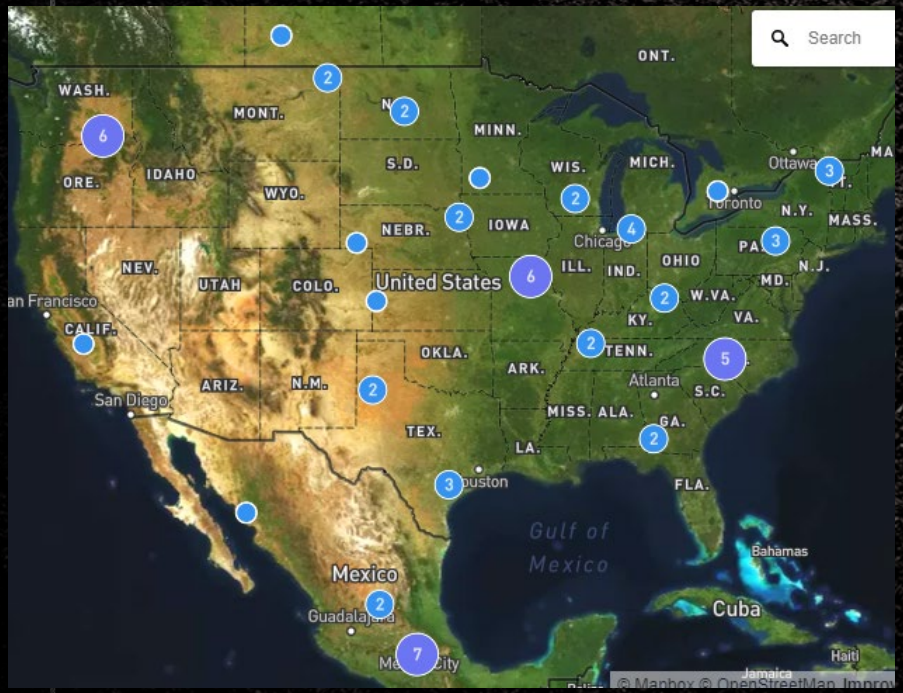
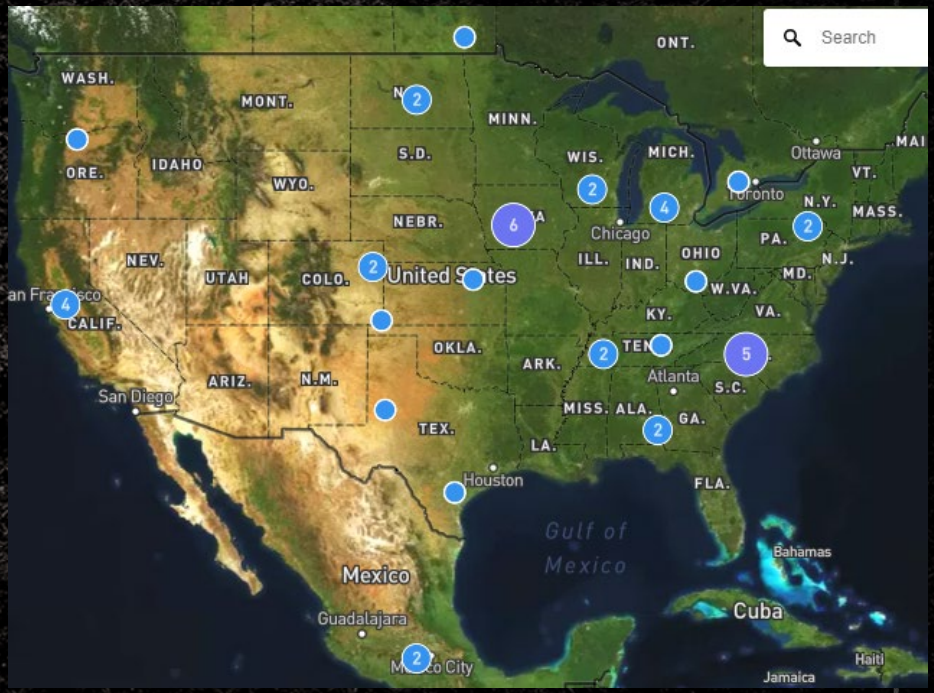
Sorting by Treatment

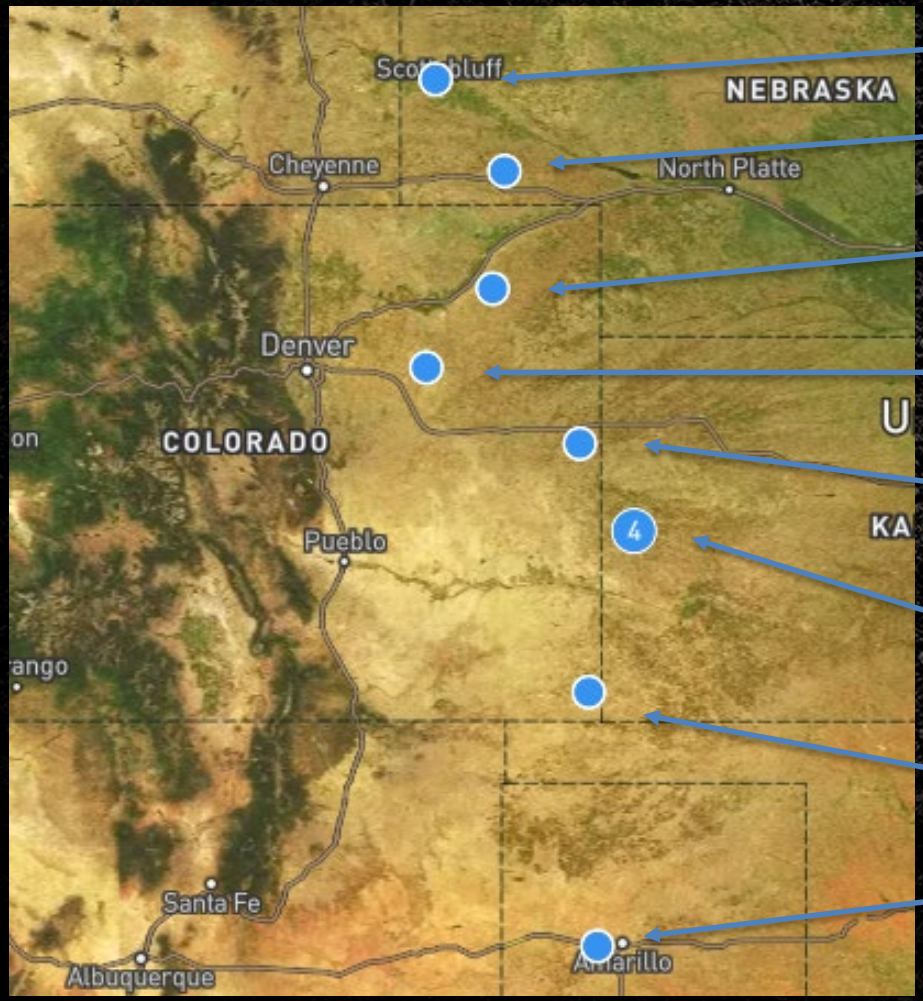
Tillage Treatment Sites – 62



Cover Crop Treatment Sites - 42



SHI Web-GIS – S. Great Plains N/S transect
(similar rainfall across latitude)



Knorr-Holden Plots – Scottsbluff, Nebraska

HPAL Long-Term Soil Management Tillage Study – Sidney, Nebraska

Sterling Dryland Agroecosystem Project – Sterling, Colorado

Byers Colorado Long-Term Fertilizer/Biosolids Site - Byers, Colorado

Stratton Dryland Agroecosystem Project – Stratton, Colorado

Large scale cropping systems; Long-term irrigated corn fertility; Long-term irrigated grain sorghum fertility; Tillage Intensity Study sites at Tribune, Kansas

Walsh Dryland Agroecosystem Project – Walsh, Colorado

Graded Terraces – Soil and Water Conservation Study – Bushland, Texas

Update continued:

- Held technical panel that reviewed/recommended long-term sites for sampling
- Selected long-term sites for sampling
- Hired Lead Statistician / Database Manager and 6 Project Scientists across N. America
- Issued RFA for Lab analyses

Next Steps:

- Establish partnerships with long-term site P.I.’s
- Hold Planning Workshop with all P.I.’s
- Award contract for laboratory analyses
- Decide on and develop database
- Plan, organize, & train for 2019 sampling
- Arrange sample storage
- Sample/analyze soils from long-term sites in 2019

Thank You!

soilhealthinstitute.org

UNIFY ***RESTORE*** ***PROTECT***

Why is it Important to Measure?

- Assess current state
- Monitor progress
- Environmental benefits
- Farm economics (we think)
- *“You cannot manage what you cannot measure”*
- *…*

Why is it Important to Measure?

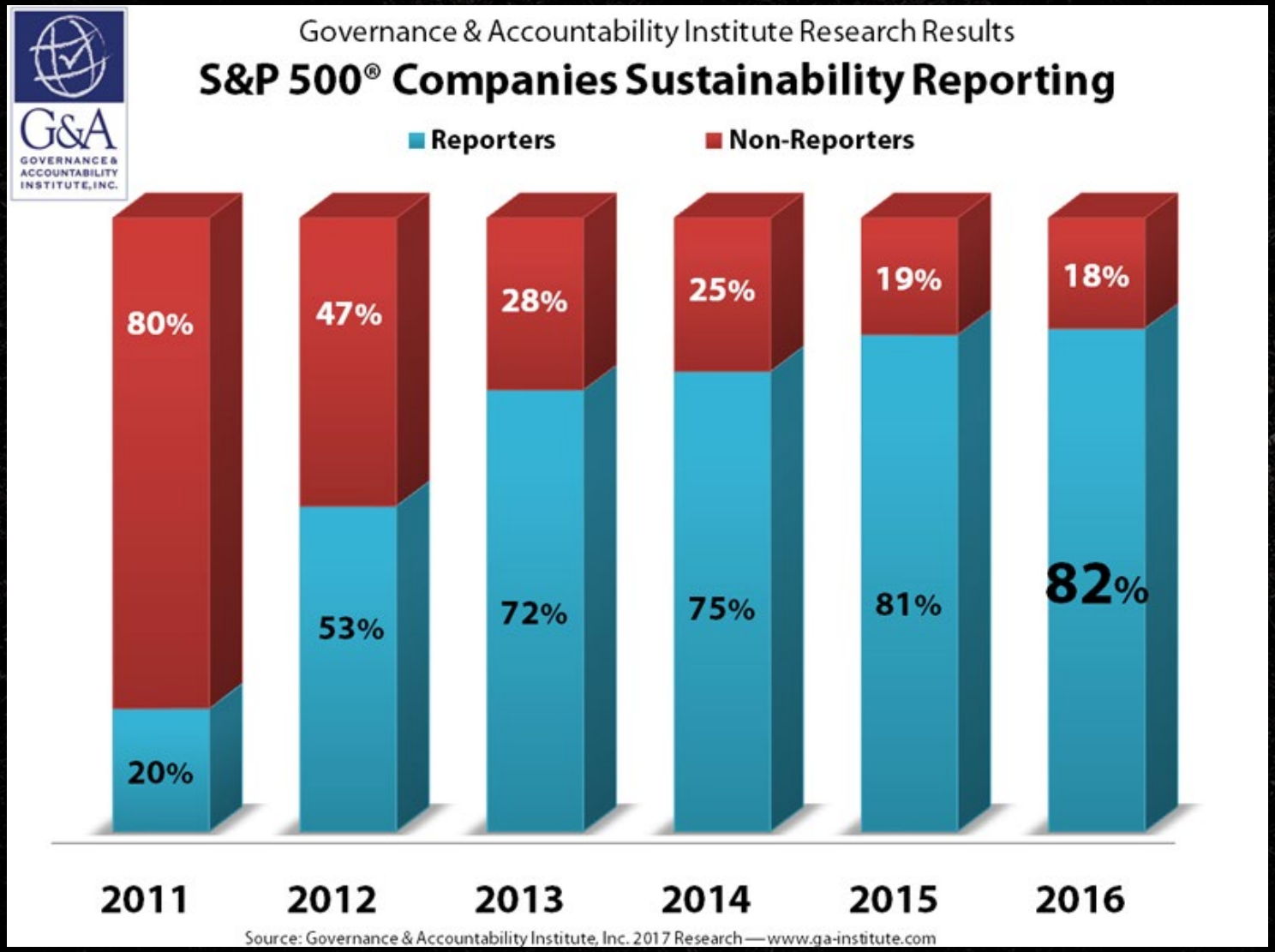
Big Picture:

Why is it Important to Measure?

Big Picture:

The opportunity we all have

for enhancing Conservation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