## **RESOURCE ASSESSMENT** Regenerative Stewardship Curriculum: Develop





## **REGENERATIVE STEWARD COURSE PLAN**



## Overview

### PURPOSE

This tool is used for the assessment of environmental and economic resources for a given operation. It can be used to monitor soil, ecosystem services, and economic changes that may come with altered management practices.

#### **PREP ITEMS**

See subsequent slides.

#### TIMING

In the early stages of the Develop phase, though the exact timing of each test in the assessment may differ based on the goals and priorities of the steward.





## Overview

### DELIVERY

Assessments should be done on-site during a farm visit. Add the test results to a spreadsheet and/or a soil health card for easy updating and evaluation later on.

#### OUTCOME

The steward and the planning team capture responses that can be used for evaluating ecological and economic changes.

#### STAFF

Planner trains stakeholders during the planning process.





## Materials

### SOIL HEALTH CARD

- Shovel
- Penetrometer
- Clear plastic cups
- Bits of metal screen for Aggregate Stability
- Water
- Soil thermometer
- Small 10x hand lens
- Soil Health Card
- Pen
- Sharpie
- GPS unit
- Soil probe
- <u>Residue Handbook</u>



## Materials

### **BULK DENSITY**

- Soil bulk density rings
- Wood block
- Dead blow hammer or rubber mallet
- Dull soil knife
- Hand trowel
- Ziplock bags

### INFILTRATION

- 6-inch outer diameter infiltration rings
- 3 gallons of water in container
- Saran wrap
- Graduated cylinder
- Stop watch

#### LAB TESTS

- Soil probe
- 5 gallon bucket
- Ziplock bags
- Sharpie

### **CARBON SEQUESTRATION**

- Soil probe
- Ziplock bag
- Sharpie







## lier lvs. lier 2

Our resource assessment protocol consists of both basic and specialized levels of assessment. Most of our assessments include the basic Tier 1 assessment. Addition of any Tier 2 assessments depends on the objectives of the farm where monitoring is taking place.

### **TIER 1 ASSESSMENT**

The purpose of a Tier 1 level assessment is to gain a basic level of understanding of the soil on a given field. The focus here is on soil productivity, erosion indicators, flood regulation, water storage, habitat for soil organisms, and basic nutrient levels. Tier 1 assessments include the soil health card, infiltration, and bulk density tests.











# Tier 1 vs. Tier 2

### **TIER 2 ASSESSMENT**

Tier 2 level assessment options are individually designed to monitor specific soil, environmental, or farm-based indicators. An individual Tier 2 option or multiple Tier 2 options can be added on to the basic Tier 1 assessments for deeper analysis.

#### **Tier 2** options include:

- Carbon Sequestration Focus
- Water Use Focus, Water Quality Focus
- Farm Business Enterprise Focus
- Habitat Focus
- Weed/Pest Pressure Focus
- Feed Quality Focus
- EQIP Specialized Focus
- Wheat Trial Focus





## 

# Tier 1 Assessment

### SOIL HEALTH CARD PROTOCOL

(1-2x per year, Spring/Fall before plow)

- separately).
- 2. On your data sheet (see subsequent slides), note the date, names of data collectors, field name, time, county, landowner, producer concerns, crop rotation, and GPS location.
- 3. Dig 3 soil pits ~12-16 inches deep within 30 meters apart (~100 feet) of each other around a representative location in each sampled field.
  - measure soil horizon depths and record a visual representation in the "soil profile" column of the Soil Health Card.
  - such as soil structure and color, should be evaluated by measured layers.

1. Complete one soil card per management area (for large fields, sample every 40 acres

a. Cut a slice of soil from the sidewall and remove it for observation. Evaluate and

b. Determine the value for each indicator in the 3 pits and record on the Soil Health Card. Scores can range from unhealthy (1) to very healthy (3). Some properties,



## MAD!

# Tier 1 Assessment

## SOIL HEALTH CARD PROTOCOL, CONT.

4. Measure soil moisture with the soil moisture meter.
5. To assess wind and/or water erosion, look for evidence such as residue movement, rills on the surface, or coppice mounds around fence rows.
6. Observe the size, shape and grade of soil structure by horizon (or layer). Is it without structure (massive or dusty), blocky, or full of crumby aggregates? Use table at right for reference.

7. For Aggregate Stability, grab a golf ball sized soil clod from the surface soil (0-6 inches) of each pit, and place each clod on a dashboard until air dry or dry overnight.
When dry, place clods on a screen suspended in a plastic cup of water. Submerge the clod in the water. Record the percentage of the dry clod that stays intact after 5 minutes, then again after several hours, and again the next day. You can also collect one from an area void of chemical, biological and physical disturbance, such as a fence row.
8. Assess the presence of soil crusts. How thick is the crust in millimeters (mm)? Crust should keep its form when picked up. It is best to assess this after precipitation and before tillage. Does the crusting happen throughout the field or in only localized places?

## SOIL HEALTH CARD PROTOCOL, CONT.

9. Use the penetrometer to measure the compaction within the top 12 inches of soil. For each of the three replicate readings, have one person call out the three pressure measurements as they go to a depth of 12 inches, while a second person records those three pressures. Repeat this same measurement sequence along a low compaction area, such as a fence row.
10. For residue thickness, consult the <u>Residue Handbook</u> and record the % of ground covered with residue (to score, >75% = 3, 33-75% = 2, <33% = 1). Note decomposition state and color of the residue present.</li>

11. Observe root and pore sizes of the soil peds. Dig around a plant and carefully remove the plant from the root system. Gently shake the plant/roots to remove loose soil. The roots that remain covered in soil have rhizosheaths, or soil bound to the root by biological glues. Note the % of roots that remain covered in soil (to score, >75% = 3, 33-75% = 2, <33% = 1).</li>
12. Observe depth of soil color change and if the soil color lightens with depth. Break open a clod from the topsoil and smell it. Note whether the soil smells earthy or like inert mineral material.
13. Look for signs of earthworms like castings, burrow holes, an accumulation of organic matter around burrow holes, and any invertebrates and insects. Record all that you find and see, but only assess this if the soil is moist.

#### CLICK <u>HERE</u> TO DOWNLOAD YOUR OWN SOIL HEALTH CARD!



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# Tier 1 Assessment

### **BULK DENSITY PROTOCOL**

((1x every 3-5 years)

- 1. Label three ziplocks with the date, farm name, field name, GPS location, and the name of the lab test, "Bulk Density".
- 2. Clear all residue from the soil surface. Drive the ring completely into the ground until the ring is level with the ground. Use a hammer and a block of wood to avoid hitting the soil.
- 3. Take the trowel and undercut the soil ring, wedging it out of the soil.
- 4. Take a soil knife and clean the bottom edge so that the soil is in line with the bottom of the ring. Remove any soil from the outside of the ring.
- 5. Do not lose any soil from inside the ring.



### BULK DENSITY PROTOCOL, CONT.

6. Take the labeled ziplock bag and push the contents of the interior of the ring into the bag.
7. Place sample in the cooler.
8. Take three replicates per site.
9. Send soil samples to the lab. Double check that the bags are labeled with the date, location, and soil test name.
10. If doing carbon sampling, take bulk density at the same depth as you would for carbon sampling.

## MAD



# Tier 1 Assessment

### **INFILTRATION PROTOCOL**

(1x every 3 years)

- 1. Clear all residue from the soil surface. Drive the ring to a depth of 3
- 2. Line the ring with plastic wrap so that it covers the inside of the ring and drapes over the side.
- 3. Pour 444 mL of distilled water or rainwater into the plastic-lined ring.
- 4. Gently pull the plastic wrap away. Record the time it takes for the water to infiltrate soil. Stop time is when the soil is "glistening."
- 5. Repeat steps 2, 3, and 4 with another inch of water to estimate steadystate infiltration.
- 6. Record results (on the bottom of the Soil Health Card).

inches using a small sledge and a plastic impact driver or a block of wood.



### LAB TEST PROTOCOL

(1x every 3 years; more frequent cases may apply for Nitrate-N tests):

- 1. Use the soil probe to take soil cores at a depth of 0-6" from 10-15 GPS marked locations per 40 acre field.
- 2. Composite the cores into the 5 gallon bucket and mix well.
- 3. Take the soil and deposit it into a ziplock bag, labelled with the farm name, date, field name (location), and names of the lab tests: "Soil Texture", "Routine", "POX-C", "Total N", and "Water Soluble C & N".
- 4. Place the sample into a cooler for storage.
- 5. Send soil samples to the lab. Double check that bags are labelled with the date, location, and soil test names.

## Lab Tests

**Routine Soil Analyses include the following data points:** 

- pH
- Buffer pH
- Soluble Salts
- Organic Matter (LOI%)
- Nitrate-N (ppm)
- Phosphorus (ppm)
- Potassium (ppm)
- Calcium (ppm)
- Magnesium (ppm)
- Sodium (ppm)
- Sulfur (ppm)

- Sum of Cations (meq/100 g soil)
- Percent Base Saturation
- Zinc (ppm)
- Iron (ppm)
- Manganese (ppm)
- Copper (ppm)
- Soil Texture (1x ever)
- POX-C (1x every 3 years)
- Total N (1x every 2-3 years)
- Water Soluble C & N (1x every 2-3 years)







## **CARBON SEQUESTRATION FOCUS PROTOCOL**

(Often combined with Water Use Focus; thorough option - hire a hydraulic probe for 1 meter cores)

- 1. Use the soil probe to take soil cores at a depth of 0-15cm and 15-30cm from 17 GPS marked locations per 50 acre field, or 27 samples for fields larger than 50 acres.
- 2. Take each soil depth and deposit them into separate ziplock bags labeled with the farm name, date, field name, GPS location, depth, and name of the lab test: "Organic Carbon".
- 3. Place the samples into a cooler for storage.
- 4. Send soil samples to the lab. Double check that bags are labeled with the date, depth location, and soil test name.
- 5. Make sure you have also done bulk density in this field (Tier 1).



### **FUTURE FOCUS AREAS**

Carbon Sequestration is currently our most frequent Tier 2 focus area. Future focus areas may include:

#### Water Use

• Using a soil moisture probe to test plant available water, track irrigation applications, take precipitation data and evapotranspiration (ET) measurements, and monitor weather and irrigation management

#### Water Quality

• Used for periodic water nutrient analysis; possible focus areas include Nitrogen and Phosphorus concentrations, as well as coliform counts from tile and other surface waters

#### **Farm Business Enterprise**

• Involves the collection of in-depth economic farm information, including all farm inputs and outputs, expenses, profits, and future projections

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### FUTURE FOCUS AREAS, CONT.

#### Habitat

• Involves the collection of data related to farm capacity to provide habitat for plant, insect, and bird species

#### Weed/Pest Pressure

• Involves the collection of data related to weed and pest pressures in the field, as well as plant life cycle and stress assessments during monitoring events

#### **Feed Quality**

• Involves the collection of data related to the nutritional value of a crop or pasture, particularly for determining the sale value and use for personal livestock

#### **Crop Quality**

• Used to compare crop varieties for agronomic success and use in foods and other products



# Continue exploring tools for the second phase of our Regenerative Stewardship Curriculum, Develop, here.

**Continue exploring tools for** Curriculum, Develop, here.

