Soil Evaluation Tool

Producer Name:		Field names, legals:	
Address:			

Evaluate your field and fill in your scores for each Soil Health Indicator, in the white boxes on the right (skip the grey boxes). Some Indicators involve more than one ecological process - put the score in each column it involves. See the example on Line 1.

Indicators (and the Eco. Processes)	Low (1 point)	Modest (2 points)	Moderate (3 points)	High (4 points)	**Ecological processes**			
					Water cycle (WC)	*Nutrient cycle (NC)*	*Energy flow (EF)*	*Bio. dynamics (BD)*
EXAMPLE: Soil Aggregates	*Flour like texture*	*Texture of split pea soup with some …* ✓	*Texture of cottage cheese…*	*Texture of chocolate cake…*	*Write "2"*			*Write "2"*
Soil cover: living leaf or dead residue (WC, NC, EF, BD)	0-25% residue coverage	25-50% coverage	50-75% coverage	75% + coverage				
Capping or Crusting (WC, NC)	Soil capped over most of field or experience capping after almost all rain events	Soil capped over a large portion of the field or entire field caps after heavy rain events.	Capping occurs in problem areas of the field only	No evidence of soil capping				
Water ponding (WC, NC)	Water stands in fields for weeks after rain events, and is mostly lost to evaporation. Creates lagoons.	Water stands in fields for days after rain events. Loss to evaporation is greater than infiltration.	Water stands in fields for hours or a day after rain events, most of it eventually soaks into soil.	Water soaks into soil, with no ponding.				
Erosion from water (WC)	Washes, rills or cuts from running water are deeper than tillage pan, impact over 50% of field, impede field work, and continue to expand each year.	Washes, rills or cuts from running water are as deep as the tillage pan, impede field work in a few areas requiring repair, continue to wash from water events.	Washes, rills or cuts are shallow, plant roots help hold some soil in place above traditional tillage pan depth. Do not require repair, may fill in with normal planting or harvesting activities.	If water runs in the field it does not take soil with it, no washes, rills or cuts visible.				
Runoff Amount (WC)	Runoff can be seen after all rain events. Creeks may rise with as little as 0.25-.50" of moisture.	Runoff can be seen after moderate rain events, creeks rise with each rainfall events of 0.50-.75"	Some runoff can be seen after large rain events of 0.75-1.5". Creek levels remain steady with small water events and rise with large water events.	Little runoff can be seen, even after large rain events of 1.5" or more Creek levels remain steady over the course of the year.				
Runoff Color (WC)	Muddy - can see soil particles moving in runoff or lots of "foam" in water.	Medium brown color, some small particles can be seen in water.	Light brown color, can't see individual particles in water but water is not clear.	Clear - cannot see soil particles or "foam" in runoff.				

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		Producer Name: _____			WC	NC	EF	BD
Residue Movement (WC, NC)	Uneven or no residue left from rain or wind events. Residue piled behind stocks over majority of field.	Residue moved at specific sites plus between rows in areas.	Some residue moved in specific sites (less than 30% of field).	Even residue placement throughout field, little sign of residue movement (less than 10%).				
Soil Movement by Wind (WC)	Soil piled behind windbreak areas over majority of field, roots exposed from soil movement (pedestalling). Soil seen on snow.	Soil moved at specific sites plus between rows in areas. Sifting can be seen in portions of the field. Some dirt on snow.	Soil moved in specific sites (less than 30%) of field. High traffic or poor stand areas show evidence of movement.	Little evidence of soil movement in fields (less than 10%).				
Soil Aggregates (WC, BD)	Flour-like texture, with little or no aggregation in top 8 inches.	In top 8 inches: Mostly flour with larger pea size chunks visible. Like split pea soup.	In top 8 inches: Larger pea size chunks along with smaller particles; like cottage cheese.	Large chunks like chocolate cake at the surface and below 8 inches; porous.				
Soil Structure (WC, BD)	In top 8 inches: Soil breaks on horizontal lines of densely packed “plates”, no roots penetrate below platy structure.	In top 8 inches: Soil breaks on horizontal lines of densely packed “plates”, some roots penetrate below platy structure.	In top 8 inches: Some plates visible, as well as prism-shaped structures above and below plates. Root growth below platy zone.	In top 8 inches: Prism-shaped soil nuggets of different sizes are visible. No distinct horizontal break in the soil.				
Infiltration (WC, BD)	Use 2nd measurement. 1 inch of water takes more than 40 min to soak into soil.	Use 2nd measurement. 1 inch of water takes 20-40 minutes to soak into soil.	Use 2nd measurement. 1 inch of water takes 10-20 minutes to soak into soil.	Use 2nd measurement. 1 inch takes less than 10 minutes to soak into soil.				
Slake Test (WC, BD)	Soil aggregate (clod) starts to break down within 1 minute. OR: No air / water exchange (bubbles), and clod does not break down.	Soil aggregate (clod) holds 1/3 its shape after 5 minutes with evidence of air / water exchange (bubbles) in clod.	Soil aggregate (clod) holds more than 2/3 its shape after 10 minutes with evidence of air / water exchange (bubbles) within clod.	Soil aggregate (clod) holds most of its shape after 15 minutes with evidence of air / water exchange (bubbles) within clod.				
Residue Cycling (NC, BD)	Residue is in large “thumb size” chunks, some still standing but grey in color (oxidizing). Multiple year's crop residue is still visible.	Residue can be found in varying sizes: large chunks of residue for the 2 most recent crops to smaller, but still identifiable chunks for 3+ years' crops. High carbon stalks like corn or sunflowers take more than 3 years to decay.	Residue can be found in varying sizes: large chunks of residue for the most recent crop, to smaller chunks from last year's crop. High carbon stalks like corn or sunflowers decay within 3 years.	All residue has been broken into chunks smaller than little fingernail, and is being fed on by soil biology. Can’t keep residue around more than 1 year.				
Soil Biology (NC, BD)	Very little if any soil biology evidence seen on bare soil surface or under reside. (Insects, worms, ants or castings, trails, holes and channels)	Some surface insects can be seen under residue, mostly of the same species.	Some diverse insect populations observed when residue is pulled back, some evidence of activity (castings, trails, holes and channels).	Under residue are diverse surface organisms (insects, worms, ants) at different life stages, or evidence of activity (castings, trails, holes and channels).				

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		Producer Name: _____			*WC*	*NC*	*EF*	*BD*
Plant Distribution / Bare Ground (EF, BD)	Plants tightly spaced in one area with no plants in others during the entire growing season, every year. More than 24" bare ground between rows.	Plants spaced close in one area with no plants in others during the entire growing season, every year. 24 -12 inches between rows.	Plants spaced more evenly during the growing season. 8-12 inches between rows. It is hard to visually "row" crops during the pre-reproductive stage.	Plants spaced evenly throughout the area during the growing season, every year. Can't visually "row" crops during the pre-reproductive stage.				
Canopy (EF)	Small, similar structured leaves in the canopy allow sunshine to spill onto soil (less than 25% of sunlight is captured).	Small to medium sized leaves in the canopy allow some sunshine to spill onto soil (25-50% of sunshine is captured.).	Medium to large sized leaves of different shapes capture most of the sunlight. (50-75% of sunlight is captured).	Large leaves of different shapes create a multi-level canopy and capture most of the sunlight (more than 75%).				
Root Rhizosheath (EF, BD)	Small amount (0-25%) of roots surrounded by soil rhizosheath.	Modest amount (25-50%) of roots surrounded by soil rhizosheath.	Moderate amount (50-75%) of roots surrounded by soil rhizosheath.	Abundant amount (75-100%) of roots surrounded by soil rhizosheath.				
Root Penetration (NC, BD)	Majority of roots are shallow and turn horizontally along plow pan. Large taproot plants pushed up, out of soil. Plants easily pull out of soil.	Many roots are shallow with few extending deep into soil. Many roots turn horizontally along plow pan. Plants take moderate effort to pull out.	Many roots extend into or past plow pan. Few plow pan bends in roots, and little horizontal root growth. Plants take much effort to pull out.	Majority of root mass expands to many levels, reaching deep to pull up nutrients. Plants cannot be pulled from soil by hand.				
Root Days (NC, EF, BD)	Living root for less than 4 months per year. Human interference to prevent root growth the rest of the year.	Living root present for 4-6 months per year. Human interference to prevent root growth the rest of the year.	Living root present for 6-9 months per year, frost termination of roots in winter.	Living root 9-12 months per year, including dormant roots through deep winter.				
Crop Rotation (WC, NC, EF, BD)	One cash crop grown.	Two crops in rotation.	Three crops in rotation	4 or more crops in rotation				
Crop Diversity (WC, NC, EF, BD)	One crop category in rotation. (warm or cool season / grass or broadleaf)	Two crop categories in rotation	Three crop categories in rotation	All 4 crop categories growing on field (warm AND cool season grasses AND broadleaves)				
				Next, calculate your Ecological Processes Score. **Sum each Ecological Process column:**				
				This is the maximum possible score for each Ecological Process	56	40	28	52
				Did you skip any of these tests? If so, subtract 4 points from the maximum for each line you skipped				
ECOLOGICAL PROCESSES SCORE				Divide your score by the max and multiply by 100. This gives your scores as percentages of the max.	%	%	%	%

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Identify which Ecological Processes and Indicators are a priority concern.

1 Rank your Ecological Processs from worst to best using the scores you calculated.

2 List the lowest-scoring Indicators involved with this Ecological Process. It's ok to have duplicates – indicators are involved with multiple processes.

Priority	Ecological Process	List the lowest-scoring Indicators involved with this process. Circle which indicators you want to focus on.	Score
#1			
#2			
#3			
#4			

3 Start thinking of ways to repair the priority / deficient ecological processes. See the Instructions Sheet for more detailed information.

Water Cycle	Nutrient cycle	Energy Flow	Biological Dynamics
Cover the soil with living plants or residue. Soil cover mulches the soil surface, reducing evaporation, and protects the soil surface from rain or irrigation droplet impacts. It. It can slow the runoff of water, allowing increased water infiltration and preventing water from carrying residue and soil away. Soil organic matter can hold and store water. Make multi-year plans to increase soil organic matter. Don't create a break in the carbon cycle that will starve soil biology, forcing them to consume soil carbon. Manage your residue: your residue should melt back into the soil after 1 or 2 seasons (but varies with precipitation). Plan ahead: keep a balance of long-lasting and short-lived residue in your rotation. Think how your chemical applications will affect future crops or covers. Increase living root days: carbon is brought into the soil via living roots and their exudates. Restore the water / air balance in the soil by building stable aggregates in the soil. Stable aggregates create cavities for air and water to be exchanged and increase infiltration rates by building pathways for water to travel down. Tillage breaks down aggregates. Living roots promote aggregation by exuding glomalin, which glues soil particles together.	Keep the soil covered with residue in the field. This returns the nutrients to the system. If needed, break it down mechanically so biology can reach it and decompose it – but don't let it get used up too fast. Increase roots and living root days. Living roots continually feed the biology, which helps make underground nutrients available to plants. Integrate livestock and/or biological communities. Livestock manure, compost, and similar materials all have diverse microbes, which each contribute to nutrient cycling in their own way. Increase soil organic matter. Tillage exposes soil to the atmosphere, causing oxidation and nutrient loss.	Increase living plant/root days in the system, so that your biology doesn't starve or go dormant for periods of time. Think of both growing and dormant seasons. Increase the canopy to capture more energy and send it underground as root exudates. Protect the soil surface from sunlight. Plan multi-leaf structures and multi-level canopies. Plan successions so something is growing up while something is dying back. Even out the distribution of plants across the field – minimize large bare strips between rows, or time when the soil is bare and nothing is growing.	Minimize physical and chemical disturbance. Don't destroy the structures that the biology has built. Be mindful of chemicals that will kill biology. Plan for food and shelter for the microbes.(HOW? Provide soil cover. This provides habitat for organisms, protects them from extreme temperatures, and provides food for them. Increase living plant/root days in the system, so that your biology doesn't starve or go dormant. Integrate livestock and/or biological communities. Livestock manure, compost, and similar materials all have diverse microbes, which each contribute to the ecosystem in their own way.

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Identify potential corrective actions.

Brainstorm strategies and actions you can take to repair your priority challenges. Don't limit yourself now - you'll make your final selections later. Work with your TA/Mentor/Peers who can help you think creatively.

List your #1 Priority Indicator that you want to improve:	
List the Ecological or Economic Process(es) it's associated with:	
What were the main strategies used in this field in the past to address the challenge / root cause?	
What changes have you noticed since implementing the main practices? Are your practices having the desired effect? Why or why not?	
What new practice(s) could address the challenge / root cause?	
How would these practice(s) positively impact the soil? What are the motivating factors for considering them?	

List your #2 Priority Indicator that you want to improve:	
List the Ecological or Economic Process(es) it's associated with:	
What were the main strategies used in this field in the past to address the challenge / root cause?	
What changes have you noticed since implementing the main practices? Are your practices having the desired effect? Why or why not?	
What new practice(s) could address the challenge / root cause?	
How would these practice(s) positively impact the soil? What are the motivating factors for considering them?	

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List your #3 Priority Indicator that you want to improve:	
List the Ecological or Economic Process(es) it's associated with:	
What were the main strategies used in this field in the past to address the challenge / root cause?	
What changes have you noticed since implementing the main practices? Are your practices having the desired effect? Why or why not?	
What new practice(s) could address the challenge / root cause?	
How would these practice(s) positively impact the soil? What are the motivating factors for considering them?	

Continue to the Comprehensive Soil Health Management Plan. You will decide which practices you want to implement, and the details of how to do that.

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