



SOIL ASSESSMENT

As you complete the other worksheets that relate to your property, you will see that most of your management decisions should take into account the qualities of the soil. The soil is inherently related to all other natural resources on your land. This worksheet was developed to help you identify the attributes of the soil, improve soil conditions, and make informed management decisions for your overall property.

STEP 1: Conduct a Visual Soil Assessment

Instructions: For each distinct section of your property, answer the following questions as appropriate for your land. Select the best time for assessment and take measurements at the same time every year. Take all measurements under adequate moisture conditions (i.e., not excessively dry or wet). Certain measurements, such as soil life, earthworms, structure and tillage are affected greatly by field operations and should be assessed before major tillage. Remember, this list is not all-inclusive, so be sure to take additional notes on the condition of the soil as necessary.

Indicator	When to Evaluate	Rating Description			Rating (circle one)		
		Low	Medium	High	Low	Med	High
Available Water Holding Capacity	Any time plants are actively growing; also when management changes	Plants are stressed immediately after rain or irrigation; soil has limited capacity to hold water; requires frequent irrigation	Crops are not the first in the area to suffer from a dry spell; soil requires average irrigation	Soil holds water well over time; deep topsoil for water storage; crops do well in dry spells; soil requires less than average irrigation	L	M	H
Compaction	When soil is moist but not wet; when roots have penetrated to tillage depth	Hard layers and tight soil; restricted root penetration; obvious hardpan; roots turned awkwardly	Firm soil; slightly restricted root penetration; moderate shovel resistance and penetration of wire flag beyond tillage layer	Loose soil; unrestricted root penetration; no hardpan; mostly vertical root plant growth	L	M	H
Crop Vigor/ Appearance/Crop Disease	When plants are actively growing and soil moisture is adequate	Stunted growth, uneven stand, discoloration, low yields	Some uneven or stunted growth, slight discoloration, signs of stress	Healthy, vigorous, and uniform stand	L	M	H
Crusting	Before planting or during active growth and when soil moisture is adequate	Soil surface seals easily; seed emergence inhibited	Some surface sealing	Soil surface has open or porous surface all season	L	M	H
Earthworms/Soil Organisms	Before planting or tillage; when soil is moist	Few worms, insects, fungi, or instances of soil life per shovel; no casts or holes	More worms, insects, fungi, or soil life per shovel; some casts or holes	Many worms, insects, fungi, and/or soil life per shovel; many casts or holes	L	M	H

Indicator	When to Evaluate	Rating Description			Rating (circle one)		
		Low	Medium	High	Low	Med	High
Management Altered Drainage (wetter soil surface and decreasing wetness with depth)	Late wet season; beginning of growing season	Excessive wet spots in field, ponding, root disease	Some wet spots in field and soil profile; some root disease	Water is evenly drained through field and soil profile; no evidence of root disease	L	M	H
Plant Roots	Crop is actively growing; moisture is similar for each assessment	Poor growth/structure, brown or mushy roots; roots are mostly horizontal	Some fine roots, mostly healthy; some horizontal roots	Vigorous, healthy root system; deep roots; good color; many vertical and horizontal roots	L	M	H
Salts/ Sodiums	When soil starts to dry and weather gets hot; throughout the growing season	Salts: Visible salt/alkali; dead plants	Salts: Stunted growth; signs of leaf burn from salts	Salts: No visible salt, alkali or plant damage, especially after rains	L	M	H
		Sodium: Surface seals or severe crusting; little infiltration and fluffy surface when dry; high pH	Sodium: Only some spots with sealed surface	Sodium: No crusting or fluff at surface			
Soil/ Tilth/ Structure/ Porosity	Soil is moist and not extremely wet or dry; after a period without soil disturbance (note the time since last tillage)	Soil clods difficult to break; crusting; tillage creates large clods; soil falls apart in hands; very powdery; few worm and root channels	Moderate porosity; some crusting; small clods; soil breaks apart with medium pressure; few aggregates; some old and new root and worm channels	Soil crumbles well; is friable, porous; many small, soft aggregates; many worm and root channels	L	M	H
Surface Organic Material/ Residue	After harvest and again before tillage/ spring planting	No visible roots or residue; very slow or rapid decomposition	Some residue	Lots of roots/ residue in many stages of decomposition	L	M	H
Water Infiltration	After rain or irrigation; evaluate crusting as soil surface dries	Water on surface for long period of time after rain or irrigation; may have crust on surface when dry	Water drains slowly after rain or irrigation; some ponding	No ponding after heavy rain or irrigation; water moves steadily through soil	L	M	H
Wind/Water Erosion	Early season before any tillage; after wind or rain events; after irrigation	Soil deposits; large gullies joined; obvious soil drifting	Some deposition; few gullies; some discolored runoff; some evidence of soil drifting	No visible soil movement; no gullies; clear or no runoff; no obvious soil drifting	L	M	H

STEP 2: Evaluate Your Soil Quality

Review your assessment of each indicator and determine where you want to improve your land. List the targeted soil quality improvements.

STEP 3: Identify Soil Management Options

For each issue you identified in your soil assessment, review the associated management options below and on the following page. Remember, soil quality is specific to the type of soil you have and the goals you have for it.

Problem	Cause	Management Options (check all that apply)	
No Water Holding Capacity	<ul style="list-style-type: none"> • Sandy Soil • Compaction • Low organic matter • Excessive drainage • Low biological activity 	<input type="checkbox"/> Reduce compaction <input type="checkbox"/> Increase organic residues, diversify crop rotation <input type="checkbox"/> Add animal manure	<input type="checkbox"/> Use cover crops <input type="checkbox"/> Improve conditions for earthworms/ soil life <input type="checkbox"/> Avoid tillage when soil is wet
Compaction	<ul style="list-style-type: none"> • Working wet soil • Heavy machinery • Repeated tillage at the same depth • Excessive animal traffic • Poor aggregation • Low organic matter 	<input type="checkbox"/> Avoid working wet soil <input type="checkbox"/> Reduce traffic/tillage operations <input type="checkbox"/> Use controlled traffic patterns <input type="checkbox"/> Alter tillage depth <input type="checkbox"/> Add cover crops <input type="checkbox"/> Use non-compacting tillage (e.g. chisel v. moldboard)	<input type="checkbox"/> Add organic residue <input type="checkbox"/> Avoid heavy machinery <input type="checkbox"/> Subsoil or rip when soil is not excessively wet or dry <input type="checkbox"/> Use crop rotations <input type="checkbox"/> Add animal manure
Low Crop Vigor/ Appearance Crop Disease	<ul style="list-style-type: none"> • Compacted layers • Saturated soil • Soil pathogen problems • Nutrient deficiencies or imbalance • Low organic matter • Monoculture • Low biological diversity • pH levels affecting nutrient availability • Use of ammonium fertilizers 	<input type="checkbox"/> Soil test and correct nutrient and pH levels <input type="checkbox"/> Check for pathogens/ pests <input type="checkbox"/> Reduce compaction following harvest <input type="checkbox"/> Improve drainage <input type="checkbox"/> Use animal manure <input type="checkbox"/> Add cover crops	<input type="checkbox"/> Use crop rotation <input type="checkbox"/> Diversify cropping system
Crusting	<ul style="list-style-type: none"> • Excess sodium • Low organic matter • Low crop residues 	<input type="checkbox"/> Increase organic residues <input type="checkbox"/> Reduce tillage depth <input type="checkbox"/> Use animal manure	<input type="checkbox"/> Add cover crops <input type="checkbox"/> For sodium problem, apply gypsum and flush with irrigation water

Problem	Cause	Management Options (check all that apply)	
Minimal Earthworms/ Soil Life/ Organisms	<ul style="list-style-type: none"> • Low organic matter • Low residues • Excess pesticides or fertilizers • Excess tillage • Poor aeration 	<input type="checkbox"/> Increase organic residues <input type="checkbox"/> Use conservation tillage	<input type="checkbox"/> Use crop rotation <input type="checkbox"/> Add cover crops
Management Altered Drainage	<ul style="list-style-type: none"> • Tillage pan • High water table under natural conditions • Poor soil structure 	<input type="checkbox"/> Subsoil to break up tillage pan <input type="checkbox"/> Add cover crops to the rotation	<input type="checkbox"/> Reduce soil disturbance <input type="checkbox"/> Add high residue crops
Unhealthy Plant Roots	<ul style="list-style-type: none"> • Compaction • Low biological activity • Poor soil structure/aggregation • Nutrient imbalance • Incorrect pH range 	<input type="checkbox"/> Avoid tillage when soil is wet <input type="checkbox"/> Increase organic residues <input type="checkbox"/> Diversify crop rotations	<input type="checkbox"/> Reduce compaction <input type="checkbox"/> Test soil and correct nutrient and pH levels
Appearance of Salts/ Sodium	<ul style="list-style-type: none"> • Saline or low calcium irrigation water/well • Shallow water table • Poor drainage • Excess evaporation 	<input type="checkbox"/> Leach excess salts <input type="checkbox"/> Plant deep-rooted crops <input type="checkbox"/> Grow salt tolerant crops <input type="checkbox"/> For sodium, get a soil test and apply gypsum, if appropriate	<input type="checkbox"/> Increase vegetative cover to improve soil structure and lower soil temperature <input type="checkbox"/> Manage irrigation water <input type="checkbox"/> Improve drainage
Low Soil Tilth/Structure/ Porosity	<ul style="list-style-type: none"> • Low residues • Low organic matter • Excess tillage • Fallow • Compaction 	<input type="checkbox"/> Increase organic residues <input type="checkbox"/> Use cover crops <input type="checkbox"/> Add animal manure	<input type="checkbox"/> Reduce number of tillage passes <input type="checkbox"/> Avoid tillage when wet <input type="checkbox"/> Diversify crop rotation
Low Surface Organic Matter/ Residue	<ul style="list-style-type: none"> • Excess tillage • Residue burned off • Low residue crops • Too much fallow • Insufficient additions of crop residue 	<input type="checkbox"/> Diversify or increase crop rotations <input type="checkbox"/> Add animal manure <input type="checkbox"/> Use cover crops	<input type="checkbox"/> Use high residue crops <input type="checkbox"/> Reduce tillage
Low Water Infiltration	<ul style="list-style-type: none"> • Compaction • Surface crusting • Plow pan • Poor soil structure/aggregation • Excess sodium 	<input type="checkbox"/> Add organic residue <input type="checkbox"/> Add animal manure <input type="checkbox"/> Use cover crops <input type="checkbox"/> Diversify crop rotations <input type="checkbox"/> For sodium problem, apply gypsum and flush with irrigation water	<input type="checkbox"/> Subsoil or rip when soil is not excessively wet or dry <input type="checkbox"/> Minimize tillage to preserve soil structure
Wind/Water Erosion	<ul style="list-style-type: none"> • Lack of cover/residue • Low organic matter • Poor aggregation • Tillage pan or compacted layer • Tillage practices that move soil downslope • Excessive tillage • Low diversity crop rotation 	<input type="checkbox"/> Diversify crop rotations <input type="checkbox"/> Reduce tillage <input type="checkbox"/> Use animal manure <input type="checkbox"/> Use cover crops <input type="checkbox"/> Apply irrigation water management practices	<input type="checkbox"/> Increase surface residue or roughness <input type="checkbox"/> Shorten slope length <input type="checkbox"/> Plant strip crops <input type="checkbox"/> Use windbreaks

STEP 4: Complete the Soil Enhancement Worksheet on the Following Page
 Use the guide below to complete each section of the Soil Enhancement Worksheet.

- Unit: Indicate each section of your property
- Deadline: Indicate a deadline for completing your goals
- Goal: List your goals for each section of your property
- Action: Describe methods for achieving your goals, and include a list of the resources and assistance you may need to achieve your goals

Unit: <i>SW field</i>	Deadline: <i>January 2018</i>
Goal: <i>Improve crop health</i>	
Action: <i>Add cover crops and diversify cropping system</i>	

Soil Enhancement Worksheet continued →

Unit: _____ **Deadline:** _____

Goal: _____

Action: _____

Unit: _____ **Deadline:** _____

Goal: _____

Action: _____

Unit: _____ **Deadline:** _____

Goal: _____

Action: _____

Unit: _____ **Deadline:** _____

Goal: _____

Action: _____

Unit: _____ **Deadline:** _____

Goal: _____

Action: _____

Unit: _____ **Deadline:** _____

Goal: _____

Action: _____

TIP: 1 What's in Soil?

Every soil is unique in that it contains a mixture of particle sizes and pore spaces that influence how it is managed. The mixture of sand, silt, and clay mineral particles in soils influence many soil functions, including how much water is held in the soil, how quickly the soil dries, the nutrients that can be held in the soil before leaching losses occur, ease and timing of tillage, and susceptibility to wind and water erosion.

In addition, most soils contain about 50 percent pore space, which is essentially a place for water, air, roots and living organisms to reside. All plants depend on soil organisms to decompose organic materials matter and make nutrients available.

A high functioning soil has a diverse population of soil organisms. Soil organisms can be favored by limiting soil disturbance, maintaining a cover of growing plants or plant residue on the soil, and by providing a diversity of crops or organic matter inputs to the soils.

TIP: 2 Changing Your Landscape: Rules and Regulations

Both Kansas state laws and federal laws regulate the manipulation of natural wetland areas. Wetland soils occur in areas where water covers the soil, or is present either at or near the soil surface all year or for varying periods of time during the year. Wetland soils, also known as hydric soils, also include soils that formed under wet conditions. As such, they can be very difficult to identify, and local experts should be consulted before you alter these soils.

Contact your local NRCS specialist before doing any management that removes water such as tiling (drainage), filling in wet areas or adding ditches to remove water.

Gather Additional Information and Assistance

- ✓ *Kansas Conservation Districts*
<https://kacdnet.org/districts/>
- ✓ *Natural Resources Conservation Service*
www.ks.nrcs.usda.gov
- ✓ *Kansas State University Extension Service*
<https://www.ksre.k-state.edu/>
- ✓ *Kansas Department of Agriculture*
<https://agriculture.ks.gov/>

NOTES: _____
