

# Soil Health Management Systems

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Erosion from bare fields  
into river



Oklahoma October 2012 I-35

Sediment is still the  
largest water quality  
pollutant by volume



Lubbock Texas Oct. 17, 2011





# NRCS Goals

1. Integrate Soil Health Management System planning and implementation into NRCS' conservation programs and service delivery.
2. Increase employee and customer awareness and understanding of healthy soil ecosystems and biology, and healthy soil's role in natural resource protection and sustainable agricultural production; and
3. Increase the number of producers implementing Soil Health Management Systems.



**SOIL QUALITY CARD**

Date \_\_\_\_\_

Crop \_\_\_\_\_

Yield \_\_\_\_\_

Field Location \_\_\_\_\_

Owner/Producer \_\_\_\_\_

Indicator	Preferred										Observations	Rating the Indicator		
	1	2	3	4	5	6	7	8	9	10		LOW 1-4	MEDIUM 5-7	HIGH 8-10
Soil Tilth												Soil clods difficult to break, tillage creates large clods, crusting	Soil clods break with some difficulty, tillage creates small clods, some crusting	Soil crumbles well, tills easily, mellow
Organic Matter												No visible roots or residue, light colored surface	Some roots and residue, light brown surface	Lots of roots and residue in many stages of decomposition, dark colored surface
Compaction												Hard layers, tight soil, limited root penetration below 8 inches, roots turn at 90 degree angles	Firm soil, some restriction of roots, moderate shovel resistance	Loose soil, no root restrictions, mostly vertical root plant growth
Earthworms and other Life												None to a few worms, insects or other soil life	Some worms, insects or other soil life	Many worms, insects or other soil life
Water Infiltration												Water on surface for a long period after rains or irrigation, high runoff	Water drains slowly after rain or irrigation, some ponding, moderate runoff	Water moves steadily through the soil, little or no runoff
Plant Health												Stunted growth, uneven stands, discoloration, low yields	Some uneven or stunted growth, slight discoloration, signs of stress	Healthy, vigorous and uniform stand
Erosion												Signs of severe wind stress or gullies throughout field	Some deposition, few gullies, sign of sheet and rill erosion, some colored runoff	No visible soil movement, no gullies, clear or no runoff
Salinity												Visible salts/alkali, bare areas, EC greater than 8 dS/m	Stunted growth, saline spots, EC 2 to 8 dS/m	No visible salt, or plant damage, EC less than 2 dS/m
Soil pH												pH greater than 1.0 unit higher or lower than needed for the crop	pH 1.0 unit higher or lower than needed for the crop	pH proper for the crop
Other: (write in)														

**Field Notes/Inputs**

Cropping System/Rotation \_\_\_\_\_

Support Conservation Practices \_\_\_\_\_

Tillage system \_\_\_\_\_

**OTHER OBSERVATIONS:** \_\_\_\_\_

Fertilizer inputs \_\_\_\_\_

Pesticides \_\_\_\_\_

Data Collected by \_\_\_\_\_

# Soil Health

## Planning Principles Must be Addressed

- Manage more by Disturbing Soil Less
- Use Diversity of Plants to add diversity to Soil Micro-organisms
- Grow Living Roots Throughout the year
- Keep the Soil Covered as Much as Possible
- Manage compaction
- Control erosion

Goal: To create the most favorable habitat possible for the soil food web



# SHMS Provides For

- The continued capacity of the soil to function as a vital living ecosystem that sustains plants, animals, and humans
  - Nutrient and energy cycling
  - Water (infiltration & availability)
  - Filtering and Buffering
  - Physical Stability and Support
  - Habitat for Biodiversity



# So what is a Soil Health Management System for Cropland?



## The Key conservation practices are:

- 328 Conservation Cropping Rotation
- 329 No-till or Strip-till
- 340 Cover Crops
- Erosion control practices



## Supporting practices:

- 449 Irrigation Management
- 590 Nutrient Management
- 595 Pest Management (Integrated)
- 393/332 Conservation Buffers/Filter Strip
- Water Quality Practices







What is it?		What does it do?	How does it help?
<b>Conservation Crop Rotation</b> Growing a diverse number of crops in a planned sequence in order to increase soil organic matter and biodiversity in the soil.		<ul style="list-style-type: none"> <li>Increases nutrient cycling</li> <li>Manages plant pest (weeds, insects, and diseases)</li> <li>Reduces sheet, rill, and wind erosion</li> <li>Holds soil moisture</li> <li>Adds diversity so soil microbes can thrive</li> </ul>	<ul style="list-style-type: none"> <li>Improves nutrient use efficiency</li> <li>Decreases use of pesticides</li> <li>Improves water quality</li> <li>Conserves water</li> <li>Improves plant production</li> </ul>
<b>Cover Crop</b> An un-harvested crop grown as part of planned rotation to provide conservation benefits to the soil.		<ul style="list-style-type: none"> <li>Increases soil organic matter</li> <li>Prevents soil erosion</li> <li>Conserves soil moisture</li> <li>Increases nutrient cycling</li> <li>Provides nitrogen for plant use</li> <li>Suppresses weeds</li> <li>Reduces compaction</li> </ul>	<ul style="list-style-type: none"> <li>Improves crop production</li> <li>Improves water quality</li> <li>Conserves water</li> <li>Improves nutrient use efficiency</li> <li>Decreases use of pesticides</li> <li>Improves water efficiency to crops</li> </ul>
<b>No Till</b> A way of growing crops without disturbing the soil through tillage.		<ul style="list-style-type: none"> <li>Improves water holding capacity of soils</li> <li>Increases organic matter</li> <li>Reduces soil erosion</li> <li>Reduces energy use</li> <li>Decreases compaction</li> </ul>	<ul style="list-style-type: none"> <li>Improves water efficiency</li> <li>Conserves water</li> <li>Improves crop production</li> <li>Improves water quality</li> <li>Saves renewable resources</li> <li>Improves air quality</li> <li>Increases productivity</li> </ul>
<b>Mulch Tillage</b> Using tillage methods where the soil surface is disturbed but maintains a high level of crop residue on the surface.		<ul style="list-style-type: none"> <li>Reduces soil erosion from wind and rain</li> <li>Increases soil moisture for plants</li> <li>Reduces energy use</li> <li>Increases soil organic matter</li> </ul>	<ul style="list-style-type: none"> <li>Improves water quality</li> <li>Conserves water</li> <li>Saves renewable resources</li> <li>Improves air quality</li> <li>Improves crop production</li> </ul>
<b>Mulching</b> Applying plant residues or other suitable materials to the soil surface to compensate for loss of residue due to excessive tillage.		<ul style="list-style-type: none"> <li>Reduces erosion from wind and rain</li> <li>Moderates soil temperatures</li> <li>Increases soil organic matter</li> <li>Controls weeds</li> <li>Conserves soil moisture</li> <li>Reduces dust</li> </ul>	<ul style="list-style-type: none"> <li>Improves water quality</li> <li>Improves plant productivity</li> <li>Increases crop production</li> <li>Reduces pesticide usage</li> <li>Conserves water</li> <li>Improves air quality</li> </ul>
<b>Nutrient Management</b> Managing soil nutrients to meet crop needs while minimizing the impact on the environment and the soil.		<ul style="list-style-type: none"> <li>Increases plant nutrient uptake</li> <li>Improves the physical, chemical, and biological properties of the soil</li> <li>Budgets, supplies, and conserves nutrients for plant production</li> <li>Reduces odors and nitrogen emissions</li> </ul>	<ul style="list-style-type: none"> <li>Improves water quality</li> <li>Improves plant production</li> <li>Improves air quality</li> </ul>
<b>Pest Management</b> Managing pests by following an ecological approach that promotes the growth of healthy plants with strong defenses, while increasing stress on pests and enhancing the habitat for beneficial organisms.		<ul style="list-style-type: none"> <li>Reduces pesticide risks to water quality</li> <li>Reduces threat of chemicals entering the air</li> <li>Decreases pesticide risk to pollinators and other beneficial organisms</li> <li>Increases soil organic matter</li> </ul>	<ul style="list-style-type: none"> <li>Improves water quality</li> <li>Improves air quality</li> <li>Increases plant pollination</li> <li>Increases plant productivity</li> </ul>



## CROPLAND SOIL HEALTH MANAGEMENT SYSTEMS

Soil Health Management Systems (SHMS) are a collection of NRCS conservation practices that focus on maintaining or enhancing soil health by addressing the four soil health planning principles: manage more by disturbing the soil less; diversify with crop diversity; grow living roots throughout the year; and keep the soil covered as much as possible. On highly erodible soils, additional practices may be necessary to control all forms of erosion such as contour farming (330), Contour Stripcropping (585), Grassed Waterways (412) or other practices that are needed to control gully, wind or water erosion in order to maintain soil health. SHMS are cropping system specific and contain practices that are considered “must-do” or are key practices that achieve the greatest impact on soil health by creating a synergistic effect as a system. Conservation Crop Rotation (328) and Cover Crop (340) are examples for cropland. Practices that are needed to address soil health and related resource concerns that may not apply on all cropland fields are considered “as applicable.” Examples include Irrigation Water Management (449) on irrigated fields and Filter Strips (393). SHMS can also include conservation activities that might not be included in an NRCS conservation practice but still play a key role in improving soil health. These are known as “best accepted new technology,” and examples include controlled traffic patterns and precision application of nutrients and/or pesticides. SHMS are cropping system and site specific and are developed at the state and local level.

Table 1 Key and Selected NRCS Conservation Practices that may be utilized for a SHMS on Cropland Fields

NRCS Conservation Practice Name & Number	*Planning Principle(s) Application for Entire Field	Key “Must Do” Soil Health Conservation Practices	“As Applicable” Practices to address Soil Health and related resource concerns	“As Applicable” Site Specific Erosion Control Practices	Notes
Conservation Crop Rotation (328)	CD, LR, COV	X			Cropping systems designed to increase diversity, carbon source, & provide ground cover.
Cover Crop (340)	CD, LR, COV	X			Used to enhance cropping systems and provide growing/ground cover and living root throughout more of the growing season.
Residue and Tillage Management <u>NoTill</u> (329)	DL, COV	X			Key practice used to disturb as little of the soil as possible when planting and applying fertilizers.
Nutrient Management (590)	DL, COV	X			Proper nutrient rate, timing & method; facilitating practice to provide adequate plant and residue cover.
Integrated Pest Management (595)	DL, COV	X			Integrated Pest Management provides for healthy growing plants and is a facilitating practice to provide adequate plant and residue







# Buffers and Erosion Control Practices





# Harvesting Crop Residue:





# Practices That Keep the Soil Covered



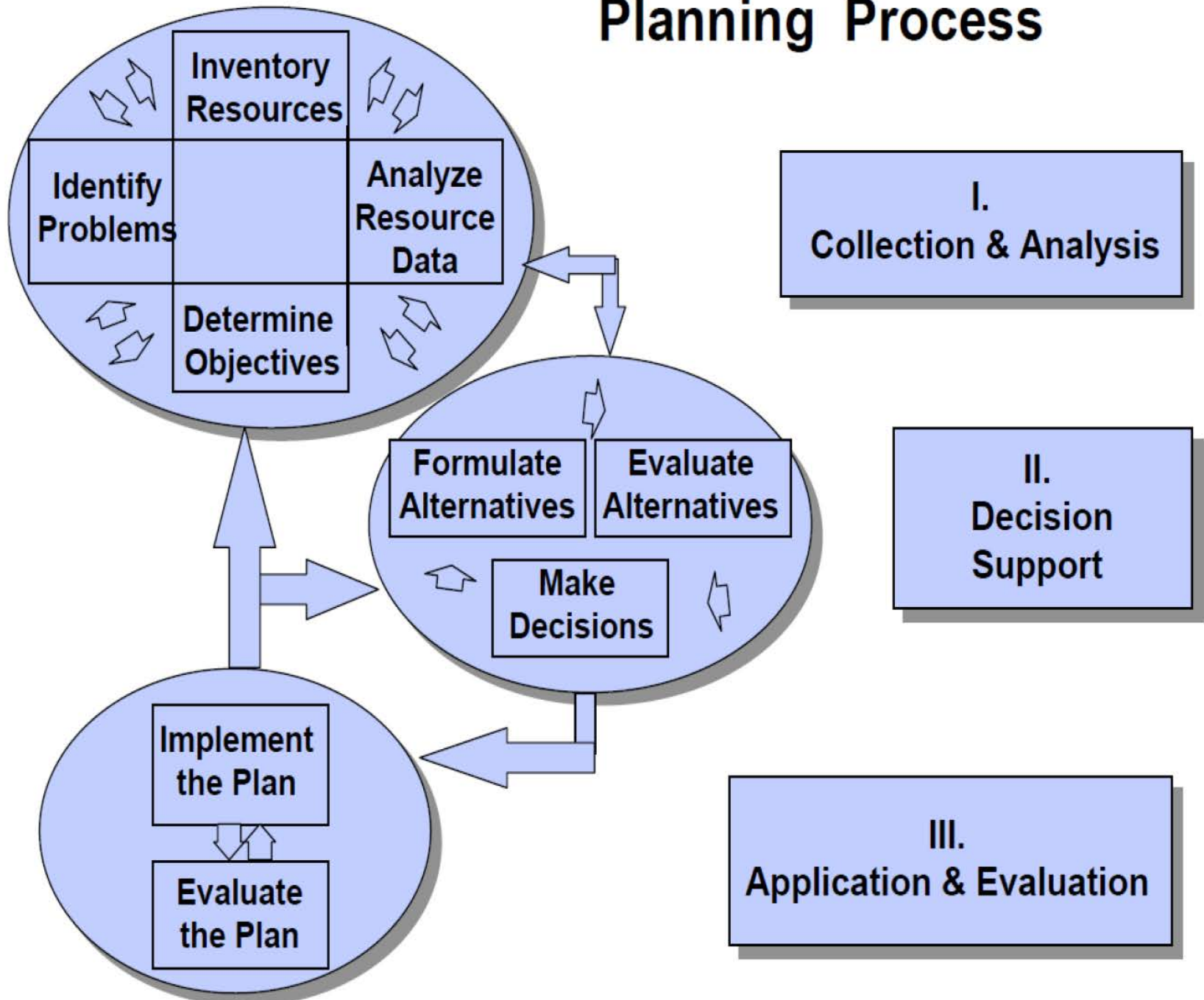


# Salinity, Irrigation, Nutrient and IPM





# Planning Process





Questions??

