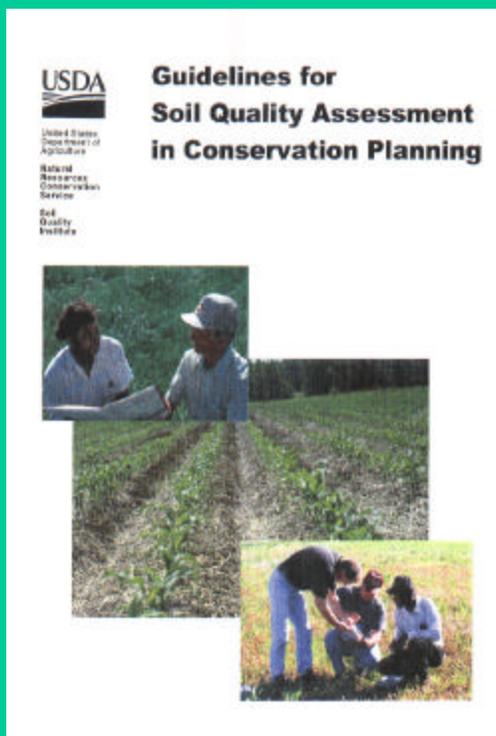
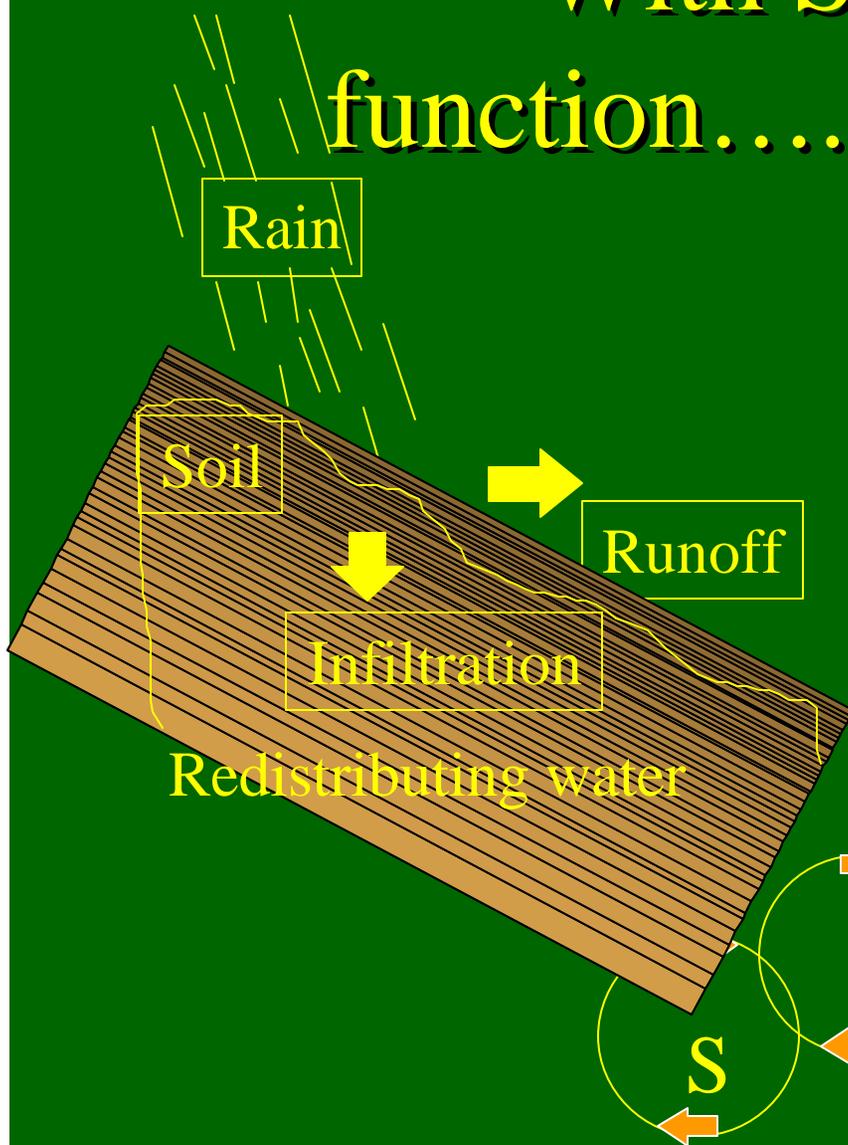


Advancing Technology in Conservation

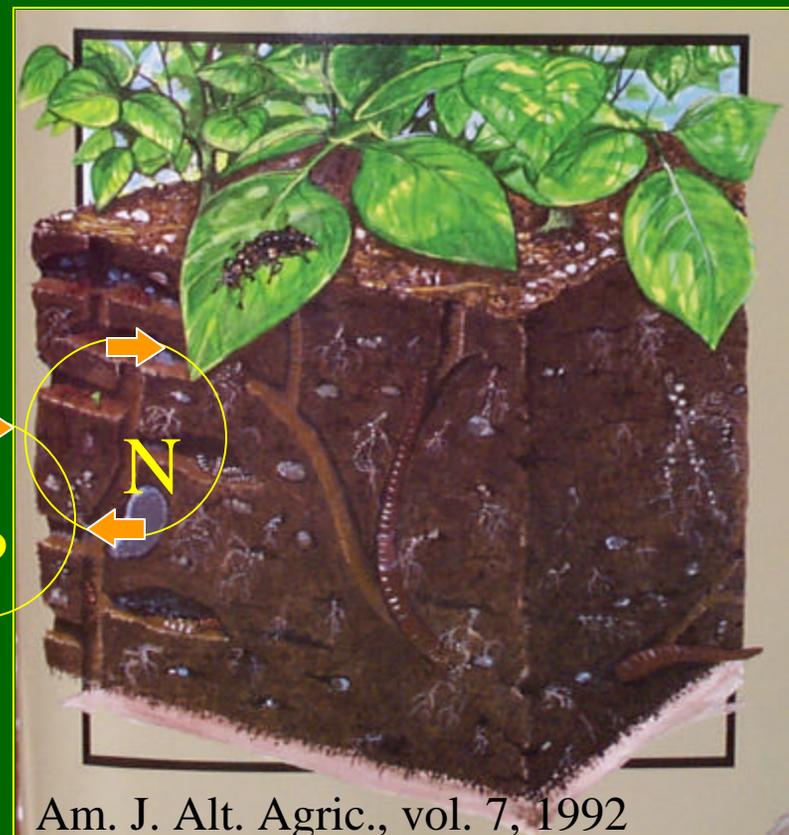


Soil Quality Institute
William E. Puckett
Director

With Soil It's about function.....and management

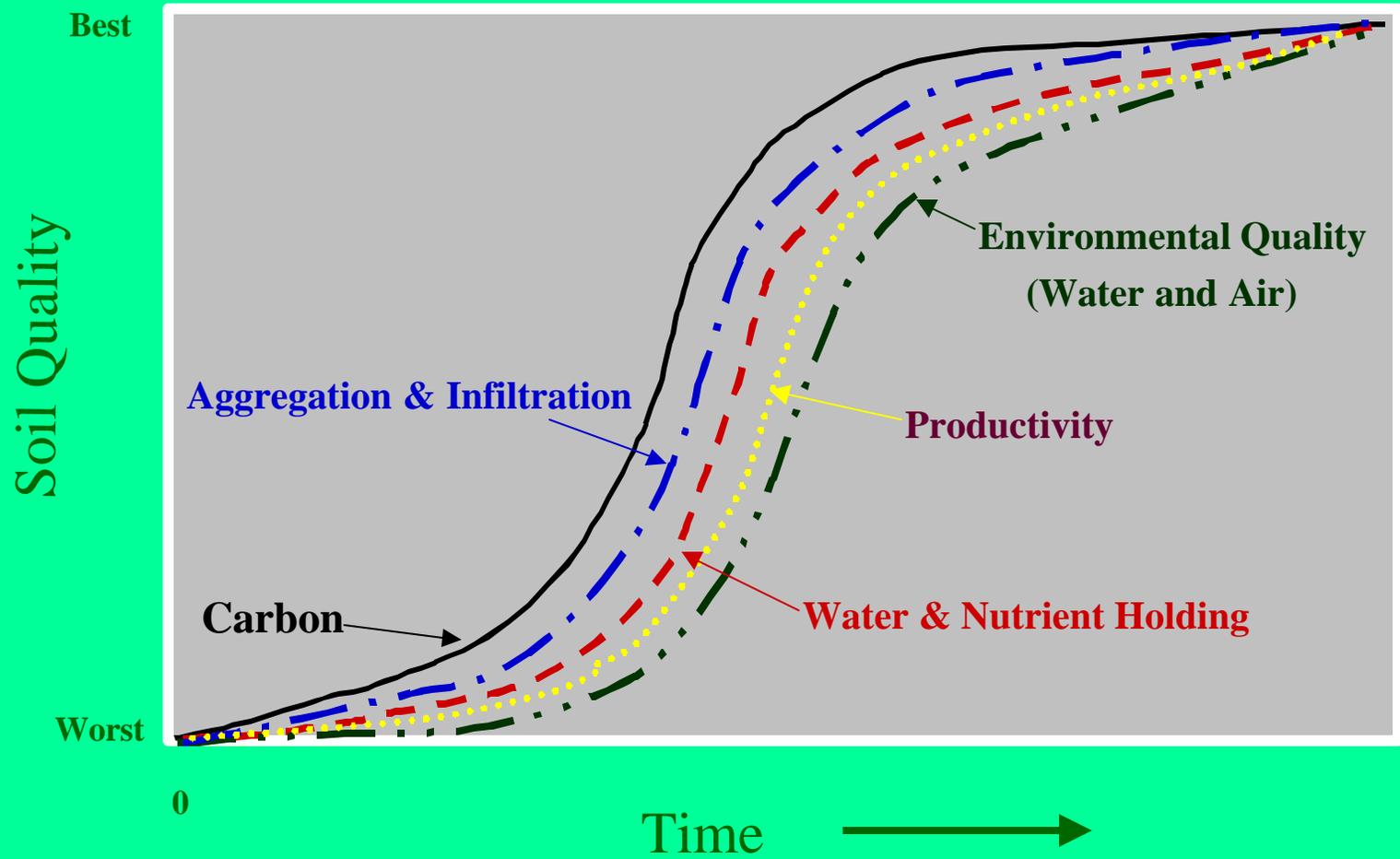


Growing plants

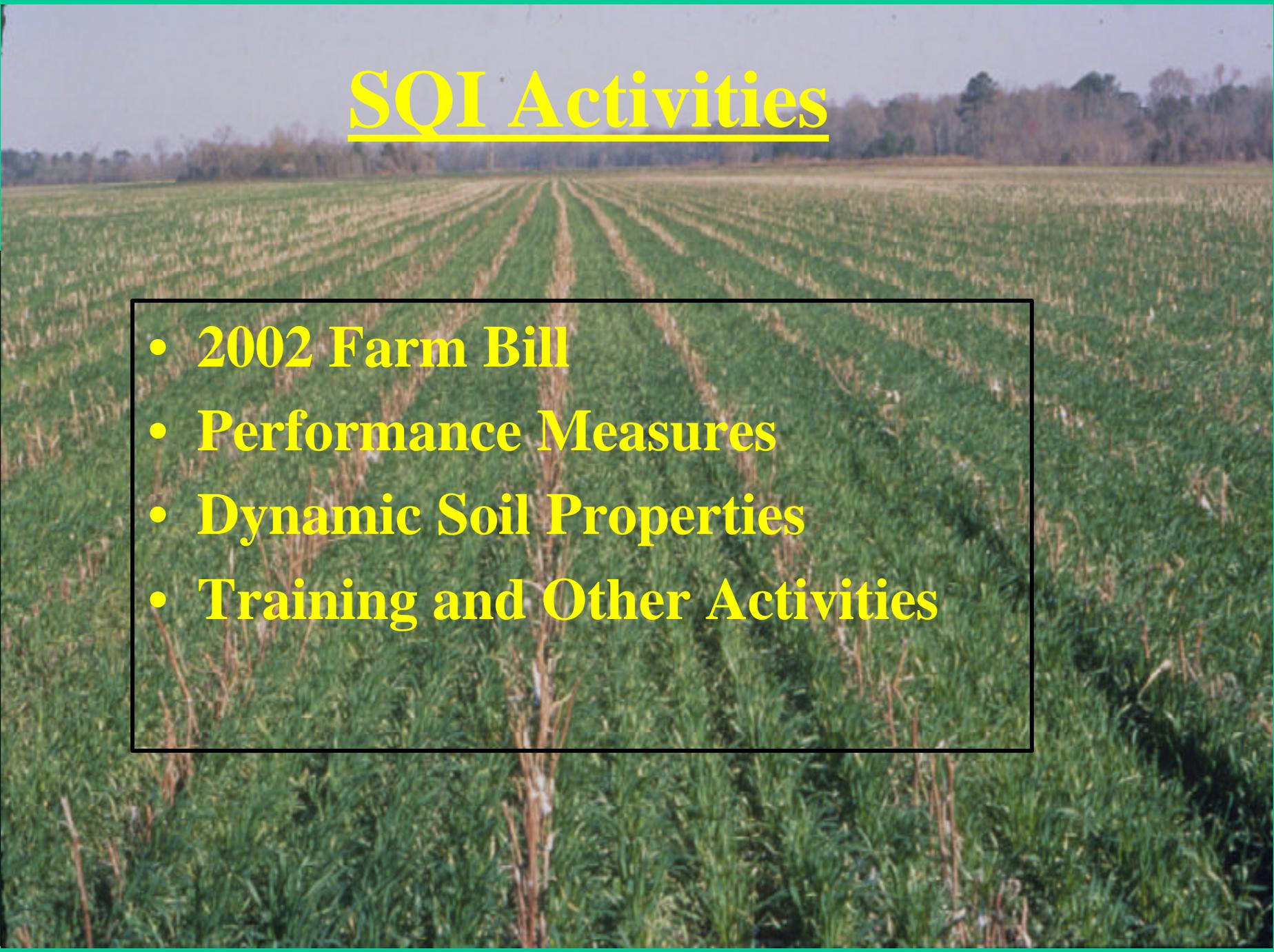


Am. J. Alt. Agric., vol. 7, 1992

Clean Water and Air depend on Healthy Soil



SQI Activities

A photograph of a large agricultural field, likely corn, with rows of crops stretching to the horizon under a clear sky. The field is the background for the text.

- **2002 Farm Bill**
- **Performance Measures**
- **Dynamic Soil Properties**
- **Training and Other Activities**



Farm Security and Rural Investment Act of 2002

- Title II – Conservation
- Title IX - Energy

Title II - Conservation

Conservation Systems that Promote Soil, Water and Air Quality

- ✍ Increase organic matter in soil
- ✍ Reduce tillage
- ✍ Increase plant diversity
- ✍ Grazing management
- ✍ Nutrient management

Title II - Conservation

EQIP:

- Establishes a national water conservation program to provide cost-share and incentives for ground and surface water conservation.
- Establishes a competitive grants program to stimulate innovative approaches to leverage federal funds for conservation purposes.
 - ✍ Government and non-government organizations and private individuals
 - ✍ Targets market-driven approaches for pollution reduction and carbon sequestration.

Title II - Conservation

Third-Party Technical Assistance:

Directs the Secretary, at the option of the producer, to provide a payment to the producer for procuring technical assistance from a non-USDA approved third party. All third-party providers must be certified by USDA.

(Soil quality training should be a part of Certification Process)

Title IX – Energy

(carbon in soils and plants)

- Rapid & inexpensive methods for monitoring carbon (LIBS)
- Interaction between conservation practices and carbon sequestration
- Validate & improve models to assess carbon (EPIC, Century, SCI, etc.)



Title IX – Energy

(carbon in soils and plants)

CAUTION: Biofuels and Residues

How much residue can I harvest and how much do I need to maintain erosion control and improve soil quality?

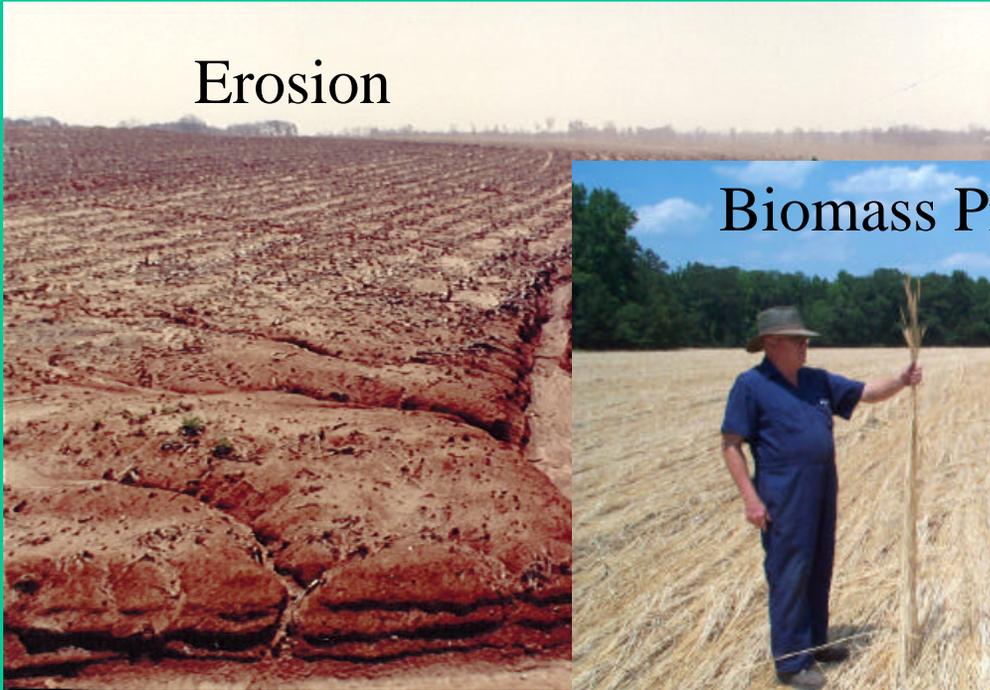
Soil Quality > Erosion (T)

Performance Measures – Outcomes????



Soil Conditioning Index

Erosion



Biomass Production

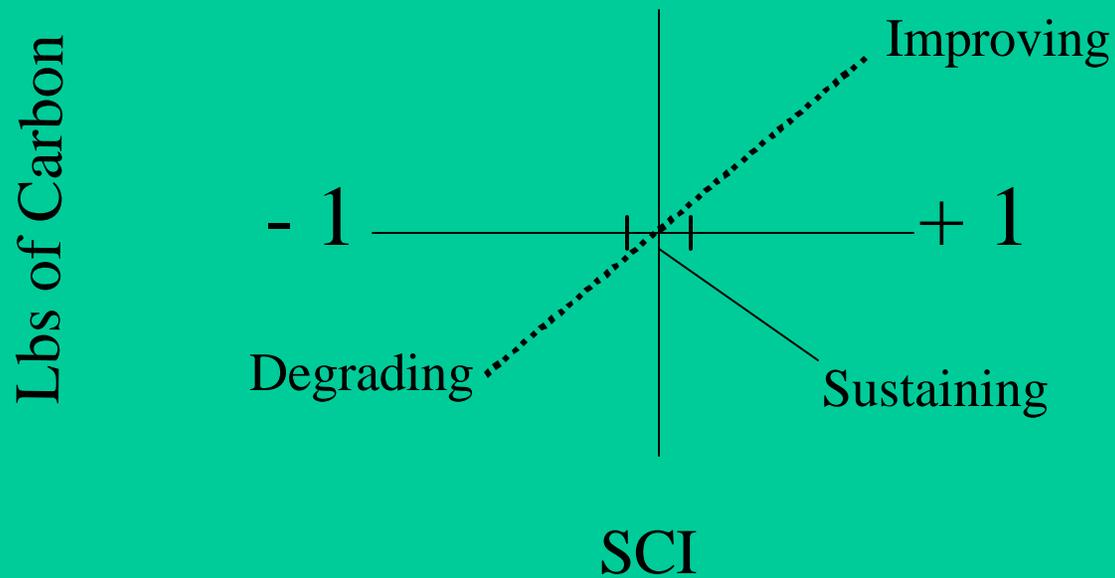


Tillage Operations

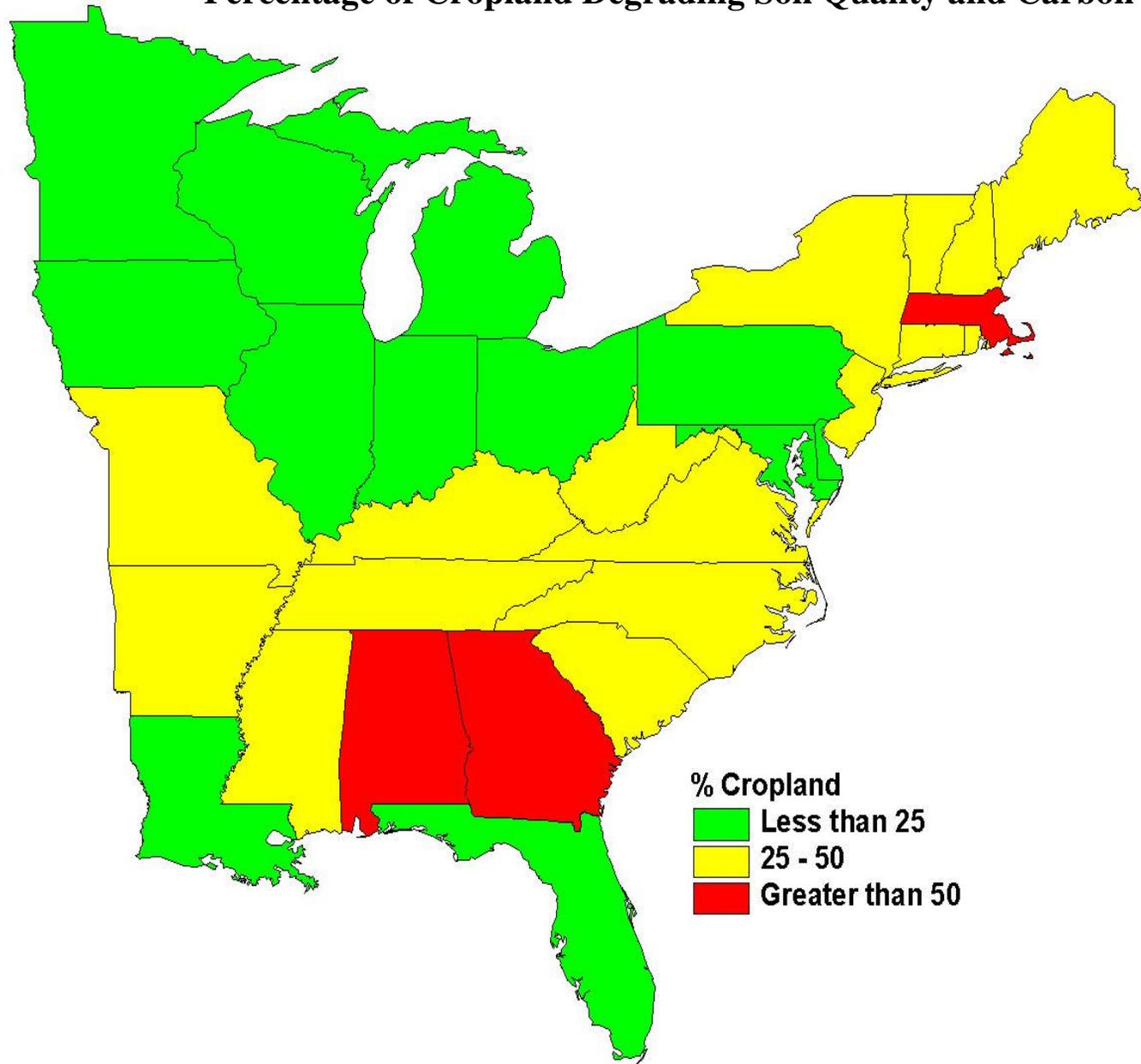


Soil Conditioning Index

(SCI=Soil Disturbance+Plant Production+Erosion)



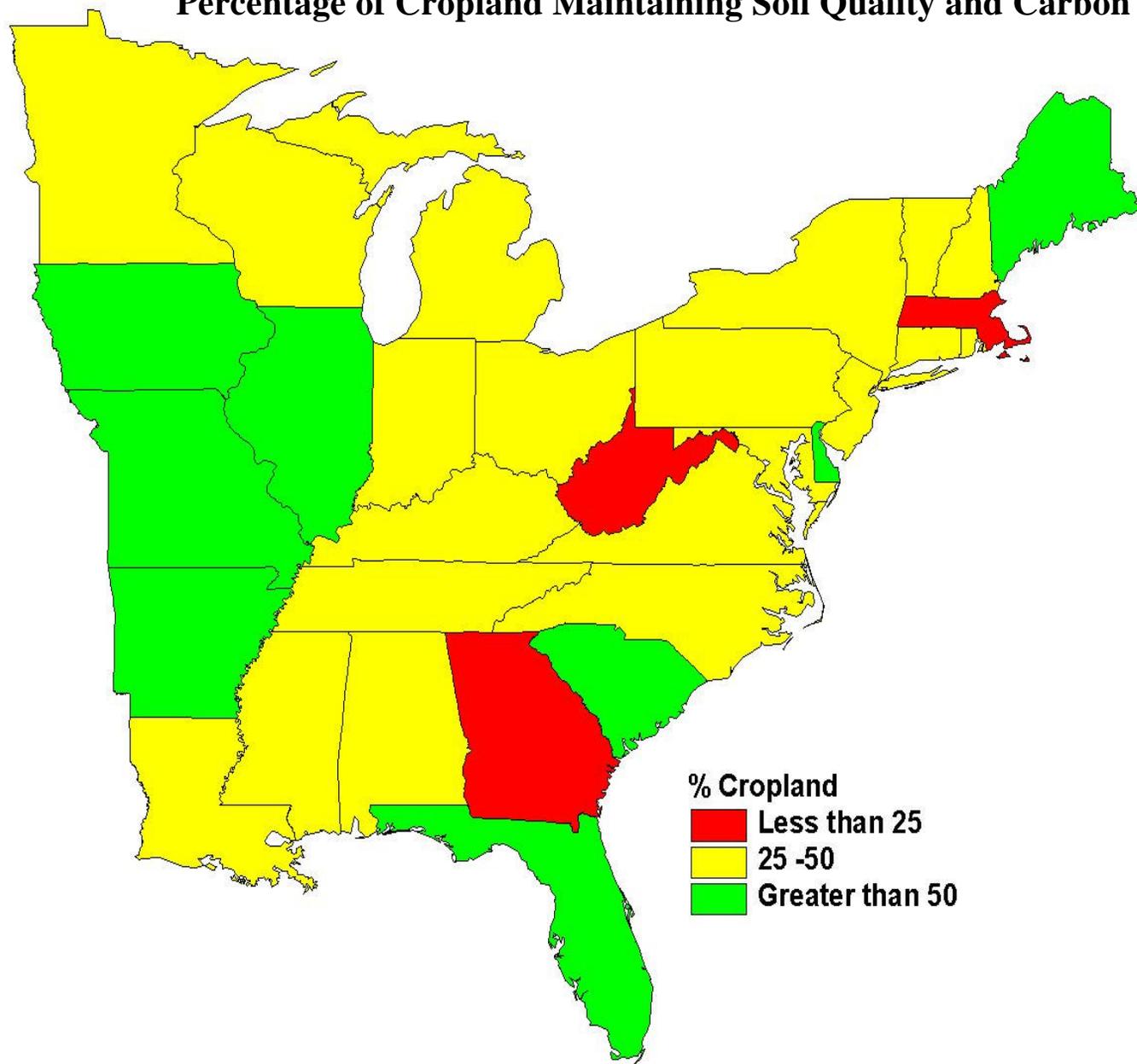
Percentage of Cropland Degrading Soil Quality and Carbon (based on 1997 NRI).



% Cropland
■ Less than 25
■ 25 - 50
■ Greater than 50



Percentage of Cropland Maintaining Soil Quality and Carbon (based on 1997 NRI).

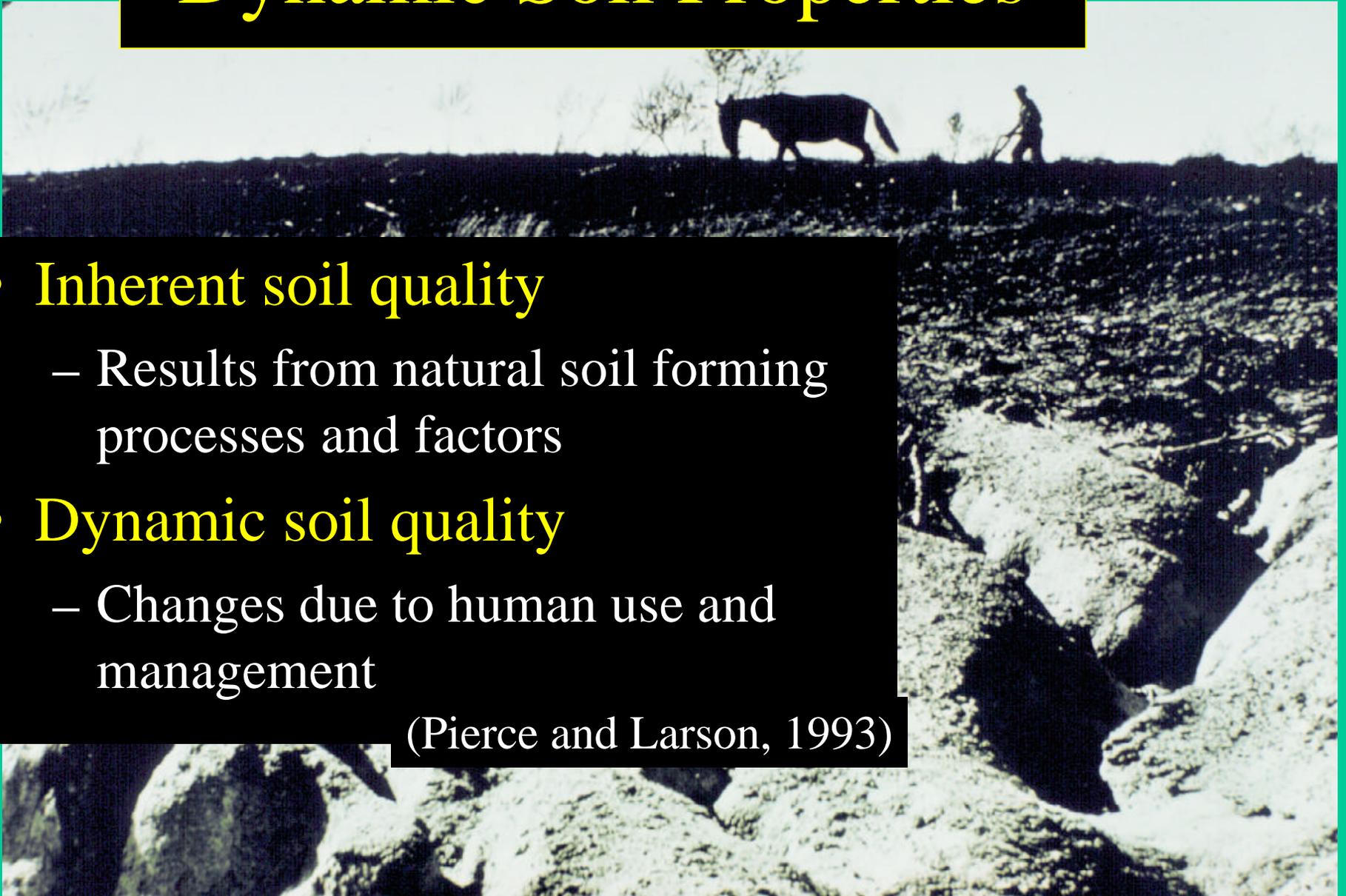


% Cropland
Less than 25
25 -50
Greater than 50

Dynamic Soil Properties

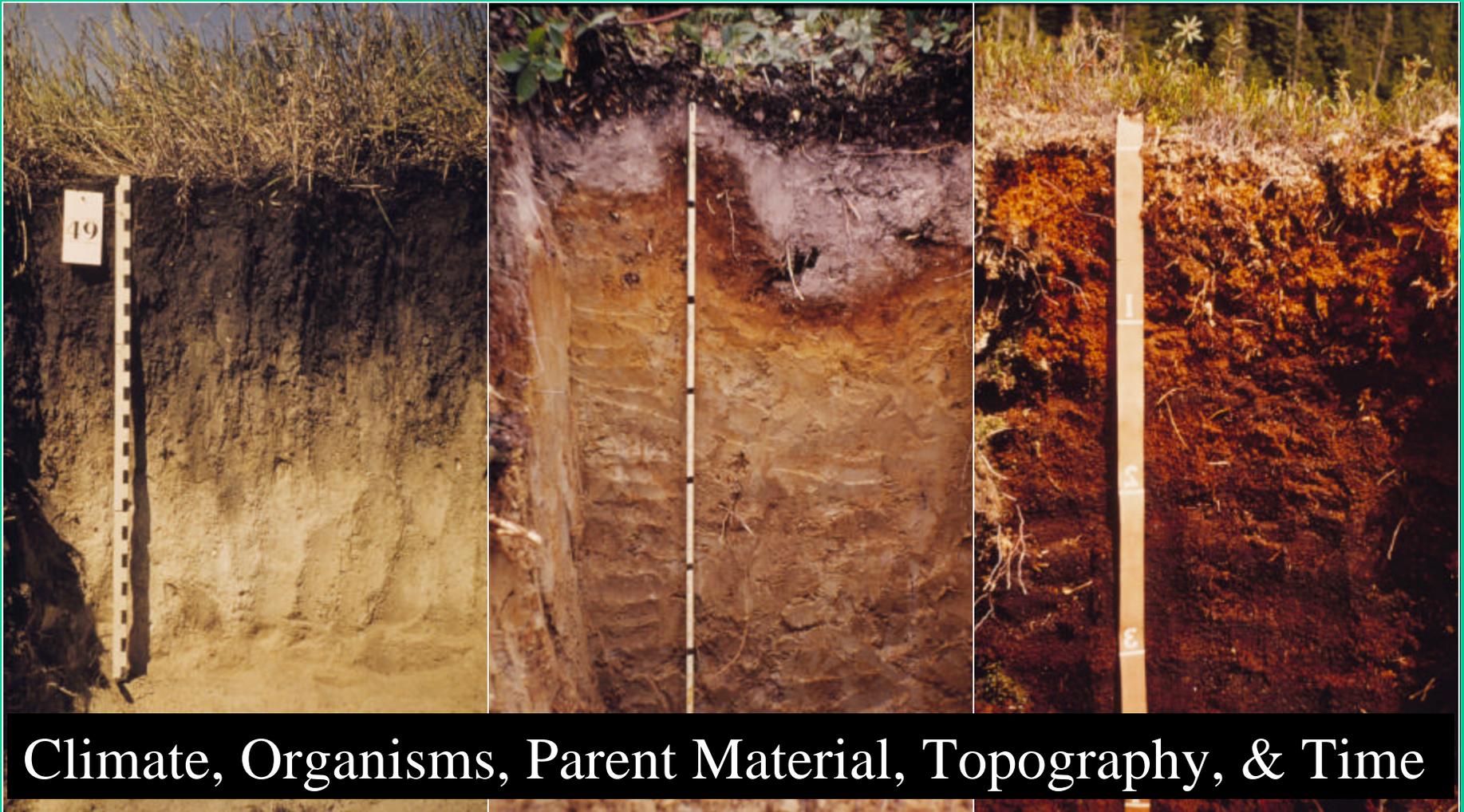
- **Inherent soil quality**
 - Results from natural soil forming processes and factors
- **Dynamic soil quality**
 - Changes due to human use and management

(Pierce and Larson, 1993)



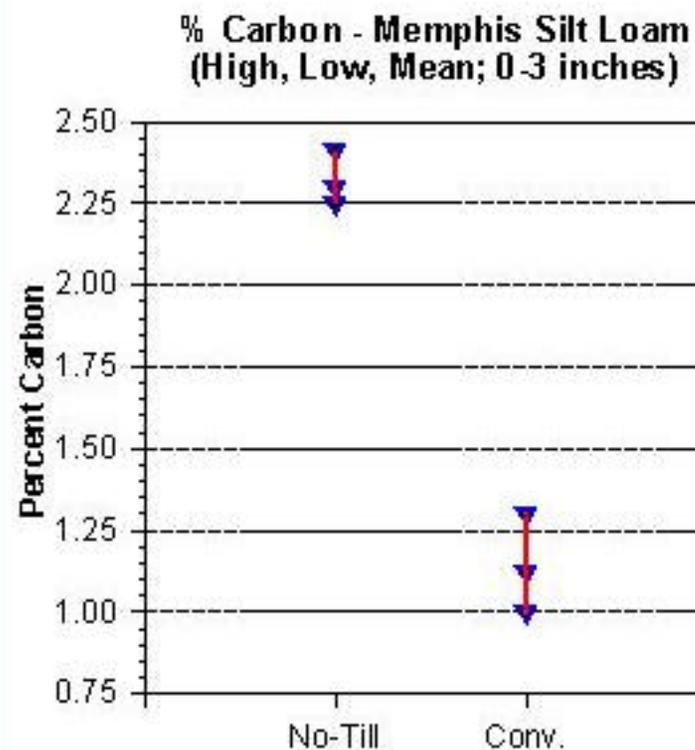
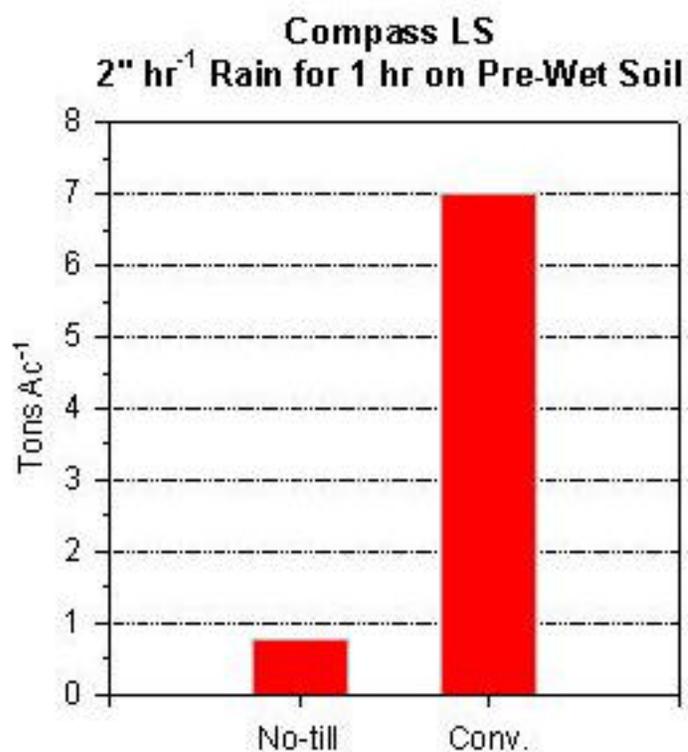
Inherent Soil Quality

(Soil Forming Factors)



Climate, Organisms, Parent Material, Topography, & Time

Dynamic Soil Properties



Interpretation Flexibility

Management Options

No-till
Cropland
(1)

Forest
(2)

Tilled
Cropland
(3)

Pasture
(4)

Composite
record

1, 2, 3, or 4

Dynamic Properties
(Use-dependent)

Inherent Properties
(Use-invariant)

Grossman et al. (2000)

Training and Other Activities



NEDC Course : Soil Quality- Assessment and Applications for Field Staff

- New York
- Nebraska
- Washington
- Hawaii and Pacific Basin
- Kansas
- Louisiana
- Tennessee
- Iowa

- Organic Matter
- Soil Biota
- Infiltration
- Compaction

Soil Quality Information Sheet

Rangeland Soil Quality— Indicators for Assessment and Monitoring

USDA, Natural Resources Conservation Service

May 2001



Rangeland Sheet 1

cycling of water and nutrients in rangeland soils are affected over both short and long distances by such processes as erosion and deposition. The kinds, amounts, and spatial distribution of living plants and decaying residue on the soil also affect nutrients and water. Accordingly, as the distribution of soil organic matter becomes less uniform, resource availability declines in some patches and increases in others.

The following qualitative assessment indicators and the attributes they reflect are from *Interpreting Indicators of Rangeland Health*, Version 3, 2000, TR 1734-6, BLM (<http://www.ftw.nrcs.usda.gov/glti>):

Rangeland health indicator	Soil/site stability	Hydro-logic function	Biotic integrity
1. Rills	X	X	
2. Waterflow patterns	X	X	
3. Pedestals and/or terracettes	X	X	

Soil Quality Information Sheet

Rangeland Soil Quality—Introduction

USDA, Natural Resources Conservation Service

May 2001

What is rangeland?

Rangeland is land on which the native vegetation is predominantly grasses, grasslike plants, forbs, or shrubs. This land includes natural grasslands, savannas, shrub lands, most deserts, tundras, areas of alpine communities, coastal marshes, and wet meadows.



reflected in soil properties that change in response to management or climate.

What does soil quality affect on rangeland?

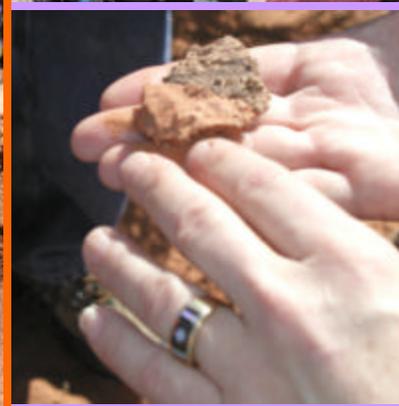
- Plant production, reproduction, and mortality
- Erosion
- Water yields and water quality
- Wildlife habitat
- Carbon sequestration
- Vegetation changes
- Establishment and growth of invasive plants
- Rangeland health

How are soil quality and rangeland health related?

Rangeland health and soil quality are interdependent. Rangeland health is characterized by the functioning of both the soil and the plant communities. The capacity of the soil to

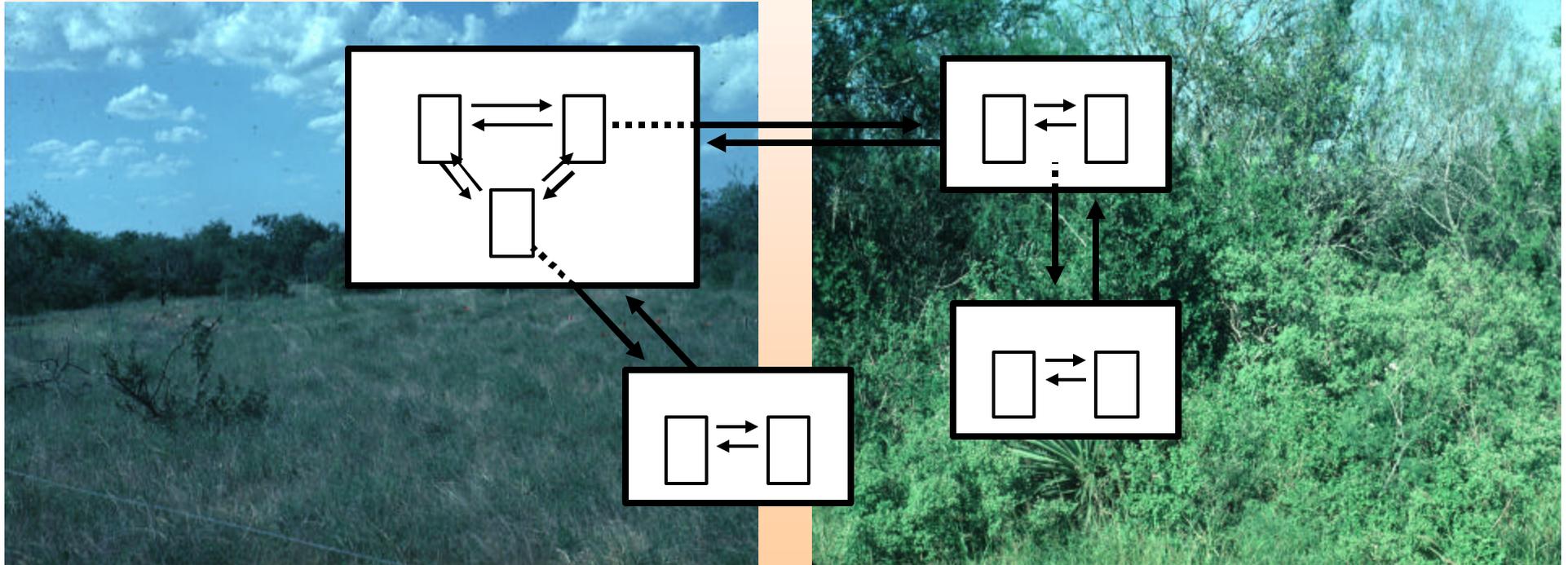
- Water erosion
- Wind erosion
- Physical And Biological Crusts
- Aggregate Stability

Biological Crust Task Force



Predicting Management Response: State and Transition Ecological Models

Model for predicting vegetation dynamics



Part of Ecological Site Descriptions

Thank You



www.statlab.iastate.edu/survey/SQI/