Soil Quality and Soil Health: What is the Role of Soil Survey?

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National Leader
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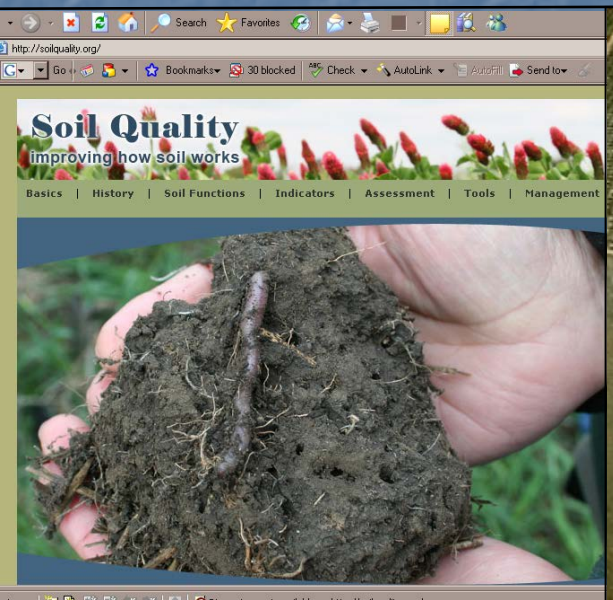
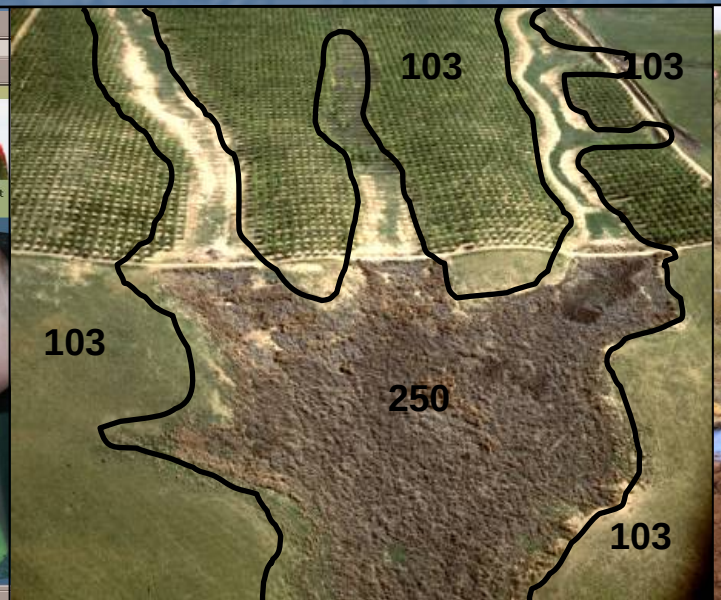
Soil Quality & Ecosystems Branch: Two Main Areas of Responsibility

- Soil Quality Technology Development (SQ)
- Dynamic Soil Properties (DSPs)





Brief History of Soil Quality

- Affected in 1995; 2004 & 2010 reorganizations
- SQEB has technical development responsibility
- Some tech transfer
- Emphasis on assessment tools

Soil Quality Definitions

“capacity of the soil to function”

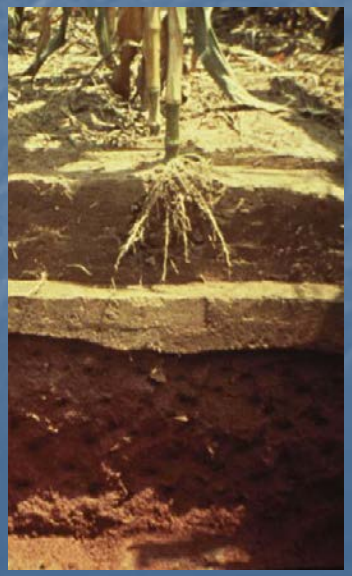
- Karlen et al. 1997

“fitness for use”

- Larson & Pierce, 1991

Kinds of Soil Quality

- INHERENT SOIL QUALITY
  - reflects natural characteristics
  - based on soil forming factors
    - climate, parent material, topography, and biota, all acting over time – Jenny, 1941



- DYNAMIC SOIL QUALITY
  - describes status or condition of soil
  - result of land use or management practice

-after Pierce and Larson, 1993

Similar Terms from the Literature:

- Genetic v. Kinetic - Richter, 1987
- State v. Behavioral
  - Koolen, 1987; Carter et al., 1997
- Genoform v. Phenoform
  - Droogers and Bouma, 1997

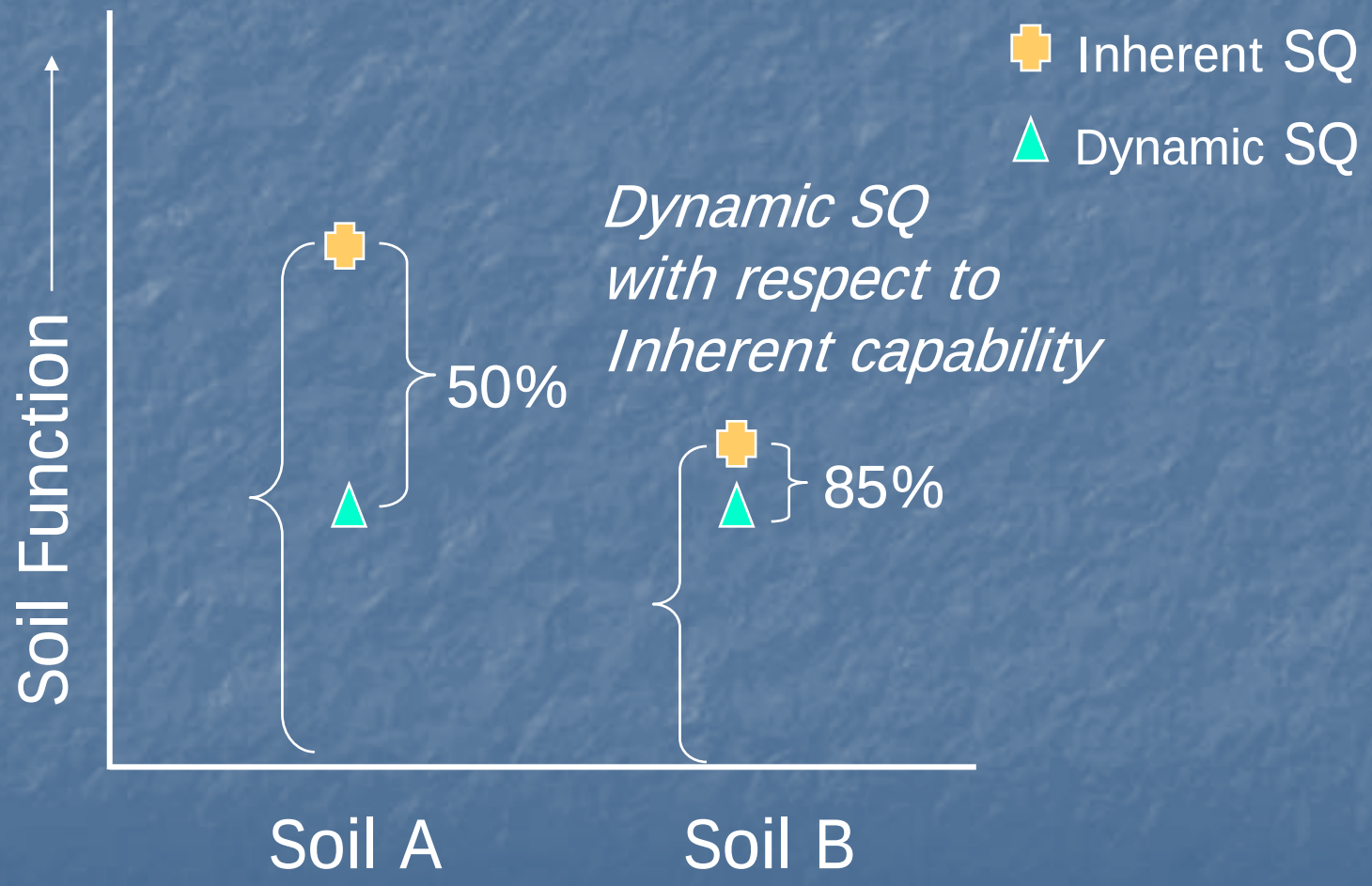
Soil Health v. Soil Quality

- Soil health is used as a synonym for soil quality - Doran and Parkin, 1996
- Minor exceptions:
  - Soil health includes only dynamic quality
  - Health some greater emphasis on biology

A soil may have poor inherent soil quality but still have good soil health.

-Gregorich and Carter, 1997

Relative Assessment



- After Andrews et al., 2004

SQEB Soil Quality Priorities

- Simple tools for conservation planning (CDSI)
- Develop tools and interpretations
  - Identify and quantify soil function
  - Agronomics, forestry, range, economics
- Inform NRCS trainers of latest science
- Advise the Soil Health Management Initiative
- Inform farm bill policy

Dynamic Soil Properties in Soil Survey

Richter and Markowitz, 2001

To inventory soil change over the human time scale, due to:

-human management

-natural disturbance

- Decades to centuries - the *recovery* time scale
- Decades and less - the *management* time scale

Tugel et al., 2005

Improve Accuracy of SS Databases

(and provide reference values for SQ indicators)

Soil organic matter

Soil	Database estimate	Grassland-measured	Cultivated-measured
Aksarben	2-4 %	6.0	3.0
Monona	2-4 %	3.6	2.9

(Grossman, unpublished)

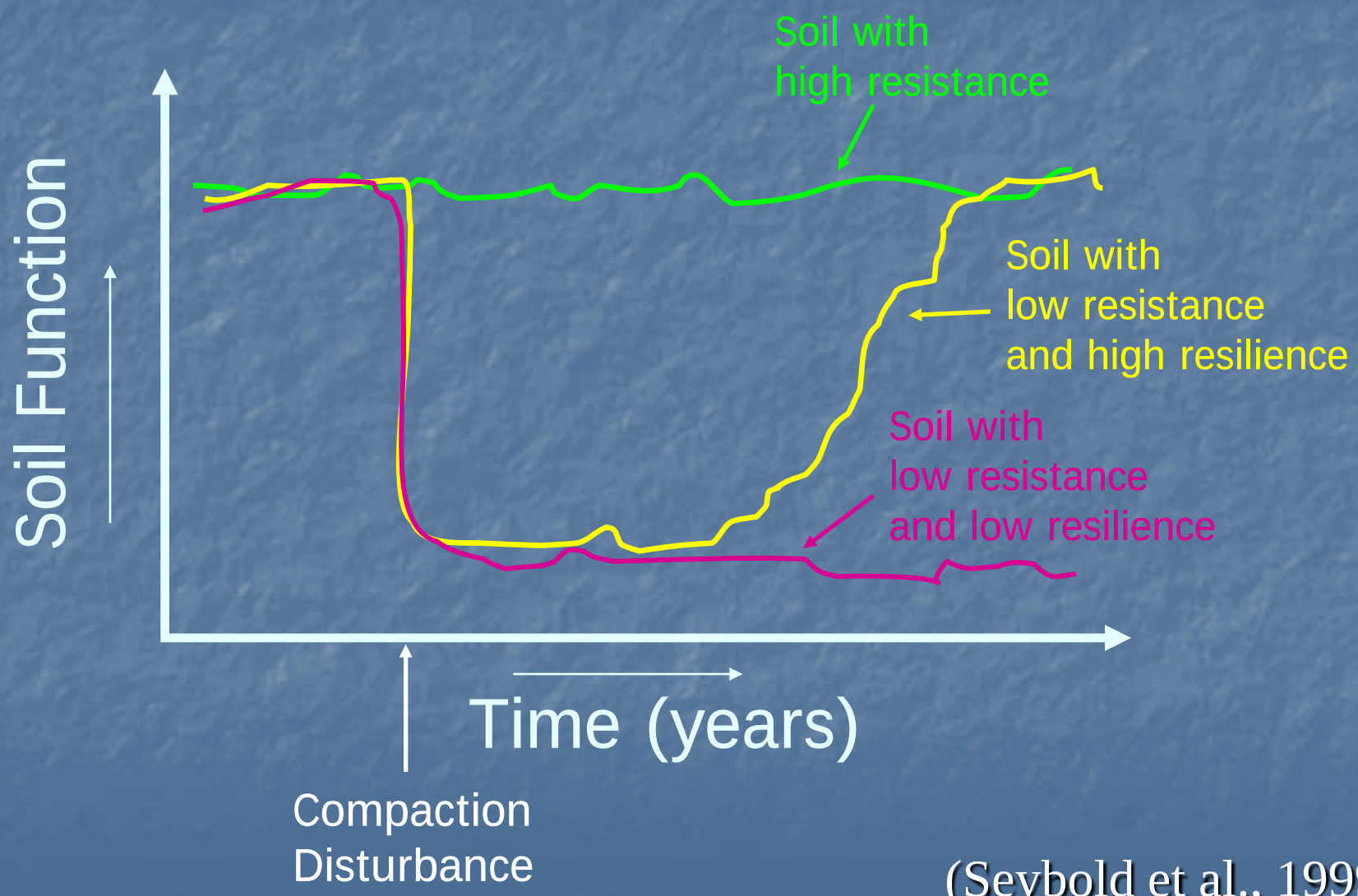
- Important for C-sequestration, water holding capacity, agg. stability, pesticide applications, nutrient applications

Develop Interpretations of Management Effects on Soil Function

- The importance of soil change is its affect on function.
- The consequences of change depend on its reversibility.

(Arnold et al.,1990)

Differences in Resistance and Resilience



(Seybold et al., 1999)

Main DSP Priorities

- FINISH RaCA!
- Develop new methodologies to rapidly populate the database
  - Models and pedotransfer functions
  - Validation sampling transects
- Hire postdoc for data mining and modeling
- Training in sampling & field office analyses
- Standards and database requirements

Role of NCSS

- Soil quality, DSPs and ecological sites are interrelated scientifically
- All have research, interpretation, and business needs
- Many opportunities for collaboration exist

NCSS in Ashville, NC 2011

- Interpretations Committee and Soil Change Working Group recommended new standing committee:

  Soil and Ecosystem Dynamics

- Other three regions also adopted the new standing committees by that name
- We propose a new West Region Committee on these topics

Questions?

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