

# Soil Quality Assessment

- This is a very new concept, therefore it is rapidly changing
- Remember that a soils quality is defined by its ability to function
- Therefore the first question that must be answered to assess soil quality is:
  - What functions do we want the soil to perform?

# Soil Quality Assessment

- Conservationist in agriculture generally want the soil to function as a growth medium for crop production which retains nutrients and water; and results in limited pollution of air and water.
- The question becomes, what characteristics must be measured to evaluate a soils ability to function in this manner.
- Are there threshold levels that can be used?

# Thresholds for Soil Quality Indicators

- There are thresholds for a soils fertility
- [Soil test recommendations](#) provide lower limits for nutrient concentrations required for crop production
  - Upper limits for nutrient concentrations in soil are more complex
  - Generally must account for the potential for off-site transport and contamination of water using a risk index (P index)
  - [Basic upper limits](#) can be set based on field variability and potential for crop response to areas with low concentrations.

# Thresholds for Soil Quality Indicators

- Penetration resistance can be used to provide and assess the threshold for compaction
- A cone index of 300 psi or greater at field capacity will restrict root growth.
- Soil must have sufficient strength to hold equipment.  
=10psi???



# Dynamic Soil Quality Indicators must be Monitored

- Currently, there are no threshold values for biological activity, organic matter, and aggregate stability.
  - How Much is enough???
  - In cultivated lands the general rule is:
    - The more the better.
    - We really don't know.
  - How much organic matter can a Pond Creek Silt loam sustain without supplemental additions?
  - How can it be compared to Norge Silt loam??
    - Should it be compared??

# Soil Quality Debate!

- Some soil scientist view the concept of soil quality as a new approach for balancing the needs for production and use with environmental protection
- Others dislike the concept because it is subjective and in some cases lack scientific basis (thresholds).
  - Many are concerned that the soil quality paradigm may lead to “advocating a system as an end unto itself”

# Soil Quality as a Goal of Management

- First, threshold values for soil properties must be developed and tested across a wide range of soil and management conditions
- There are many assessment guidelines, but many are too:
  - Simplistic (measure and score characteristics)
  - Subjective (Which Characteristics are most important)
  - Qualitative (How does the soil smell???)

# Soil Quality Assessment Tools

- Farmer-based Assessment (Page 485)
- Used to engage producers and improve their knowledge of soil characteristics
- Wisconsin Soil Health Scoreboard (WSHS) and the Illinois Soil Quality Initiative (ISQI) are examples
- The WSHS uses scores ranging from 0-4 to rank characteristics to provide an overall score for soil



# Wisconsin Soil Health Scoreboard (Example)

- Evaluates characteristics such as:
  - Residue cover, degree of erosion, ease of tillage, surface crusting, topsoil depth, drainage, earthworm population, soil structure, color, compaction, water infiltration, water retention, fertility, soil respiration, hardness, texture aeration, feel, smell.
- Time consuming, and for some attributes subjective
- Can be used to monitor affects of management

# Soil Quality Test Kits

- Can be used to measure:
- Respiration, infiltration, slaking, bulk density, EC, pH, nutrients, aggregate stability, earthworm populations.
- Provide protocols for visual observations such as soil structure root biomass, degree of erosion, compaction and depth of topsoil
- Also provide interpretation
- OSU [SQA](#)
- USDA SQA [website](#)

# Which Soil has the Highest Quality?



- If we simply assess dynamic properties such as organic matter, infiltration, biological activity, these soils could be similar
- However, inherent properties such as depth, texture, and landscape positions cause the grassland soils quality to be insufficient for cultivated crop production.

# Final Thought

- Soil quality is very much dependent on inherent characteristics
- Dynamic soil quality characteristics can be improved through management
- The extent to which dynamic properties can be changed by management depends on inherent soil characteristics and environment.