



Principles and Management to Improve Soil Health

Adam Reed

USDA-NRCS Conservation Agronomist



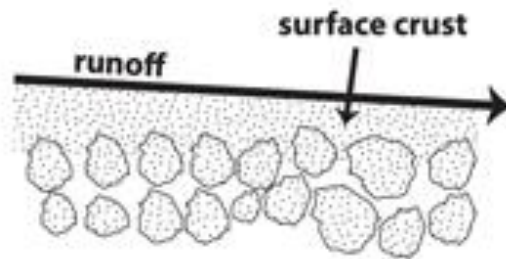
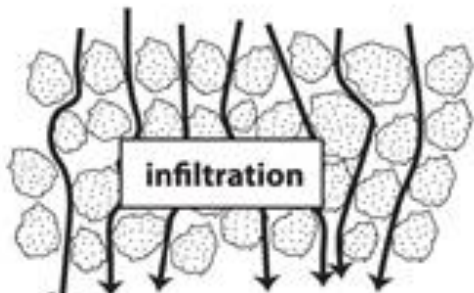
Feeling naked, hungry, thirsty and running a fever!

Ray Archuleta
2007

Soil Health Defined

The continued capacity of the soil to **function** as a vital **living** system that sustains plant, animal and human health.

- Nutrient Cycle
- Water Cycle
- Filtering
- Physical Stability



Aggregate Stability Test

Archuleta Slake Test

Water Infiltration Test

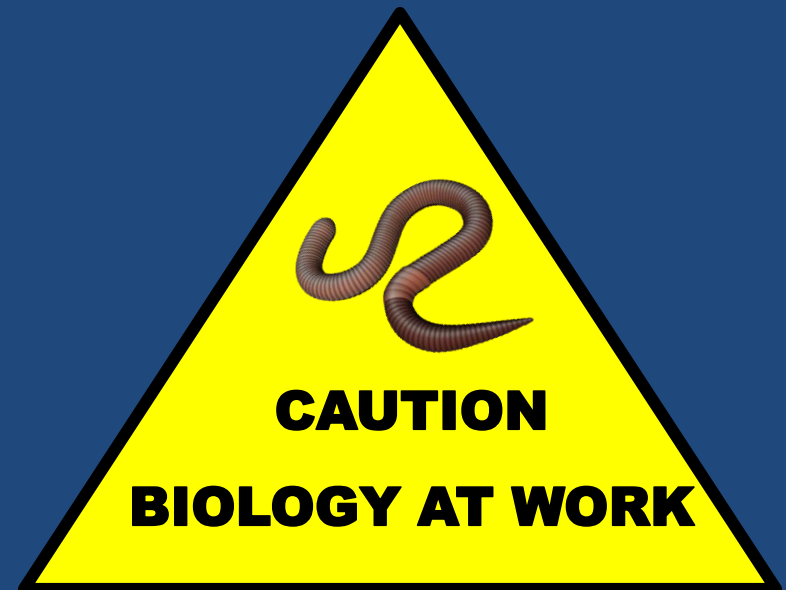
Archuleta Infiltration Test

Soil Health Defined



The continued capacity of the soil to **function** as a vital **living** system that sustains plant, animal and human health.

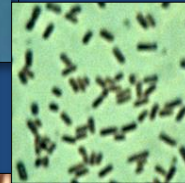
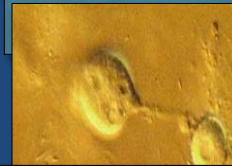
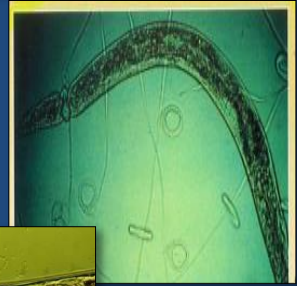
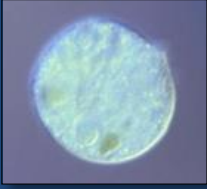
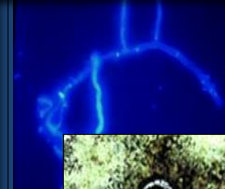
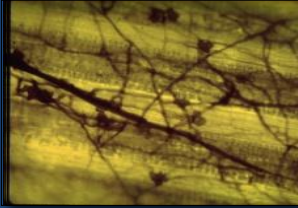
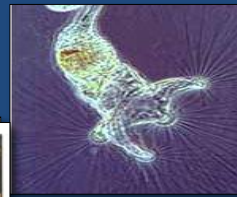
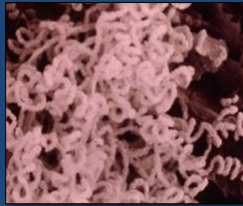
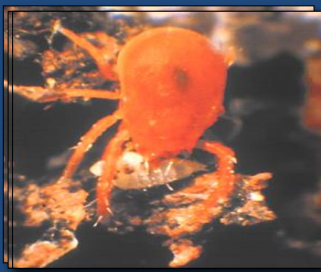
- Nutrient Cycle
- Water Cycle
- Filtering
- Physical Stability and Support
- Habitat for Biodiversity



Large Soil Biology



Soil Food Web (Soil Livestock)



Photos: Soil Biology Primer

150 Plants & Animals
24 Hours - Forest



100 Plants & Animals
24 Hours - Grassland



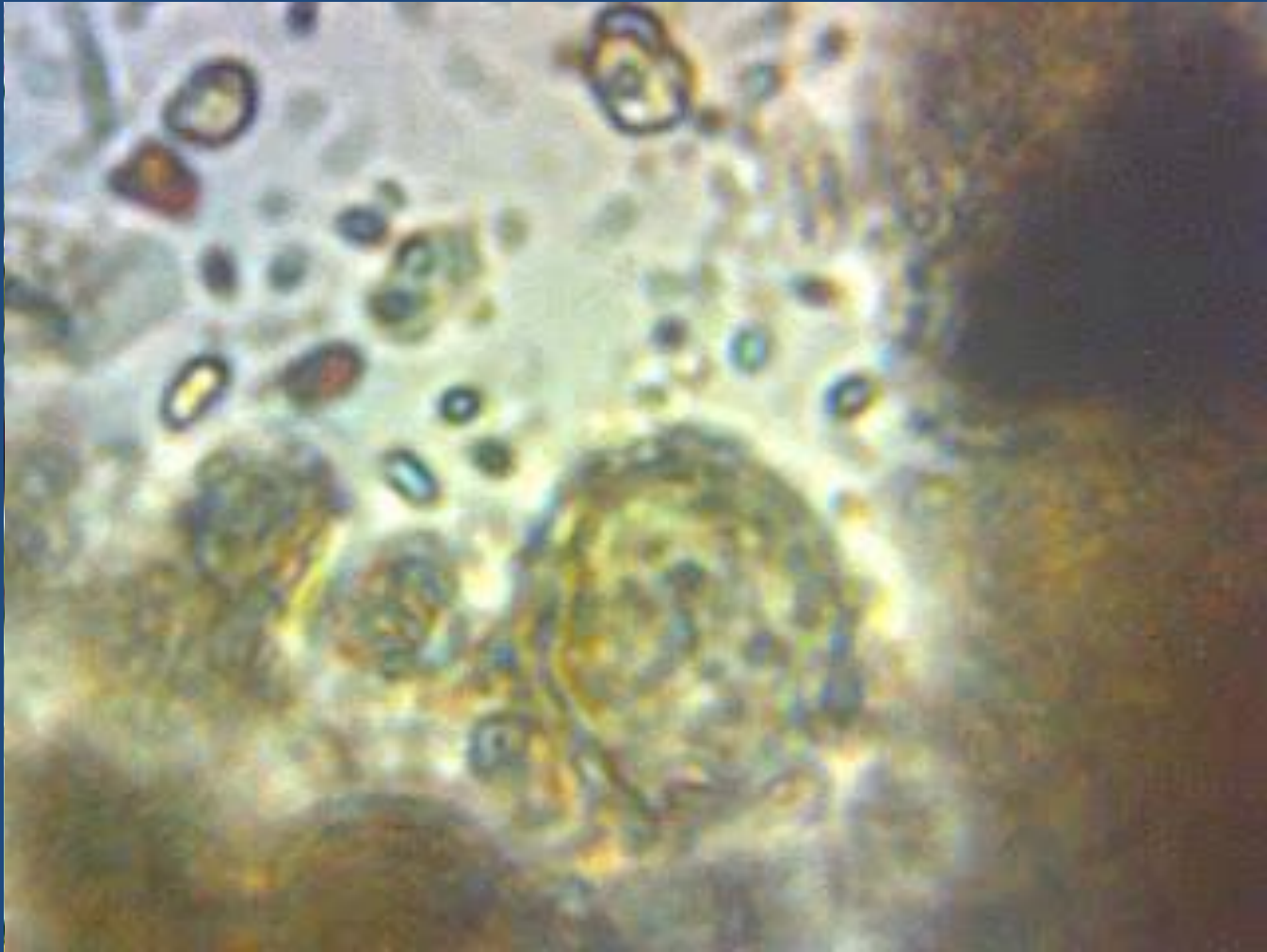
Corn Field
8 Plants & Animals
24 Hours



Build it... they will come!



Soil Sample with 1000x's Magnification



“As to methods, there maybe a million and then some, but **principles** are few. The man who grasps **principles** can successfully select his own method”

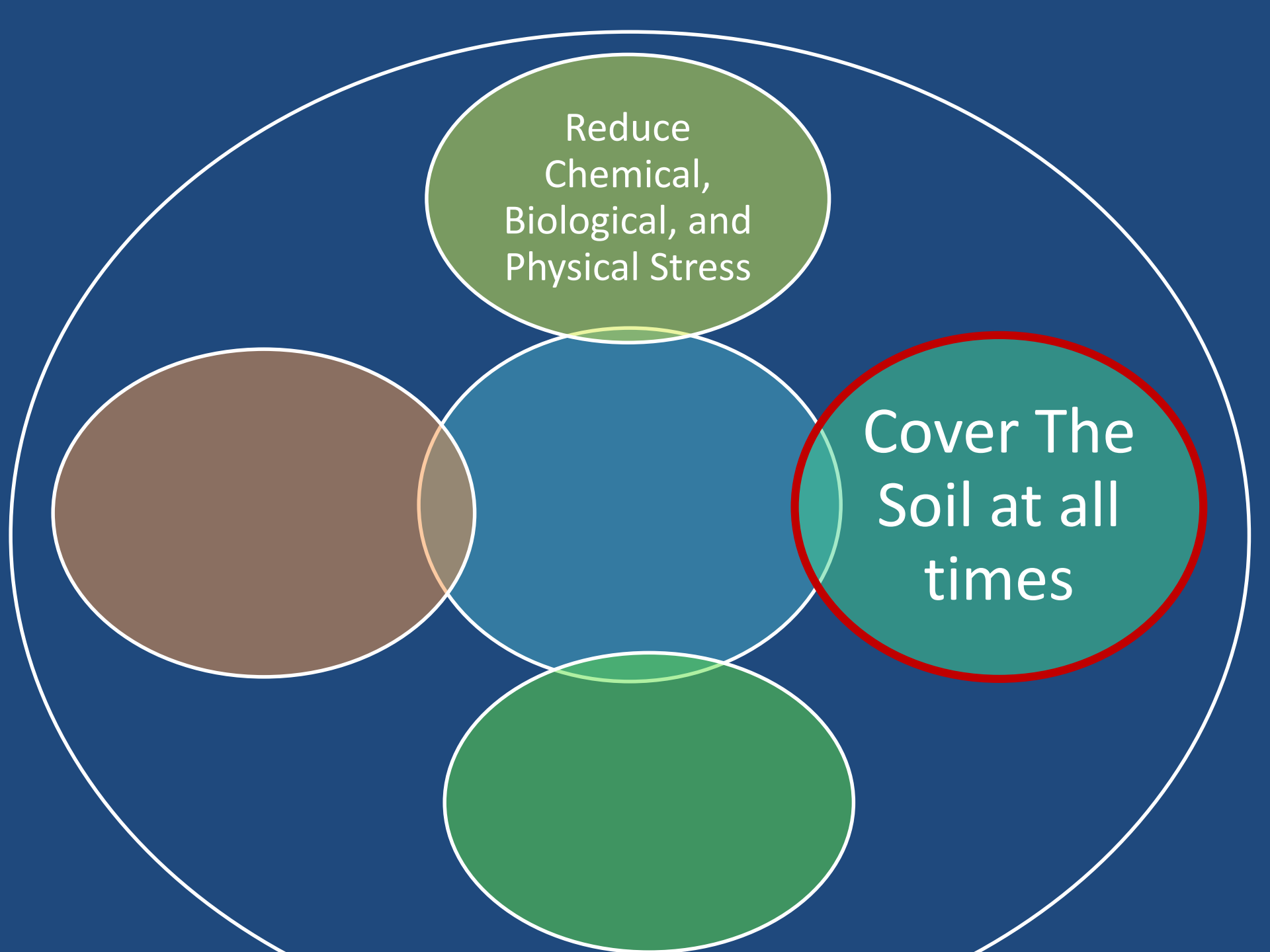
Ralph Waldo Emerson

Reduce
Chemical,
Biological, and
Physical Stress

Tillage is not your Soil's Friend

- Tillage breaks down soil structure
- Increases soil respiration rates
- Shifts soil biology to bacterial dominated
- Reduces Diversity, Eliminates Living Roots, & Exposes the Soil Surface





Reduce
Chemical,
Biological, and
Physical Stress

Cover The
Soil at all
times

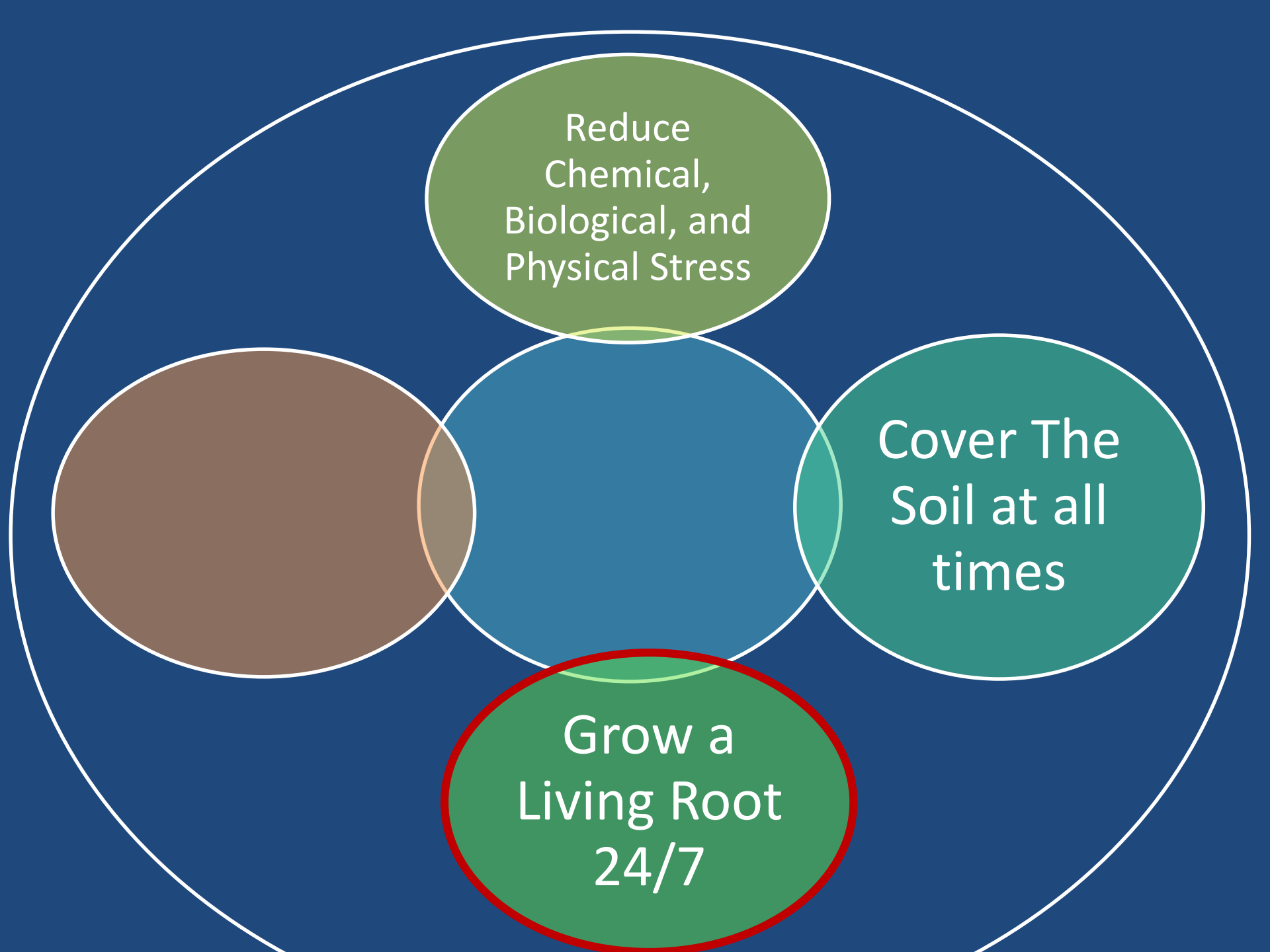
Four Principles to Improve Soil Health

- Keep the Soil Covered at all Times
 - Residues
 - Mulches
 - Live Plants



What Cover Crop is Best?





Reduce
Chemical,
Biological, and
Physical Stress

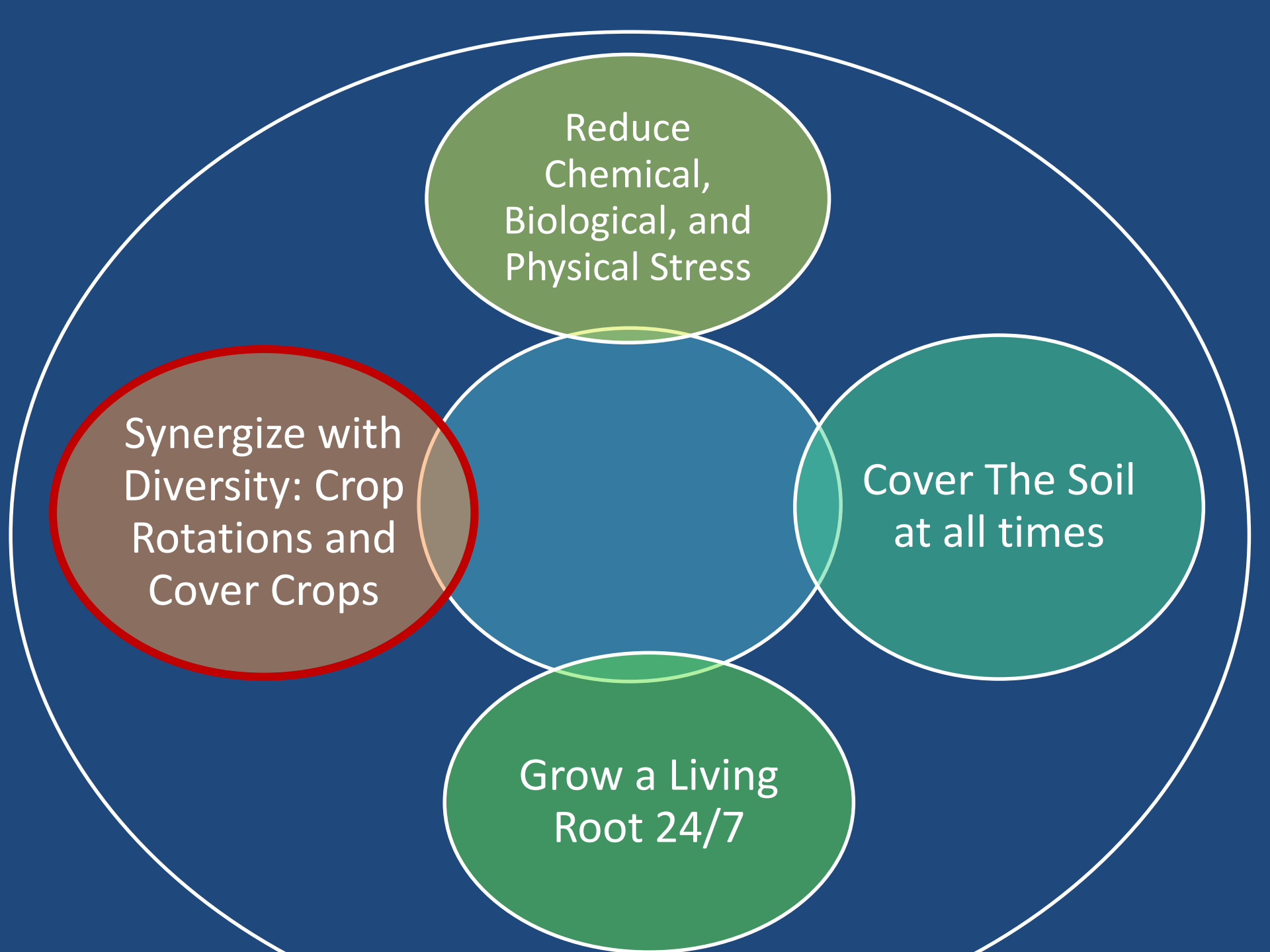
Cover The
Soil at all
times

Grow a
Living Root
24/7

Four Principles to Improve Soil Health

- Keep Living Roots in the Soil
 - Root Exudates Feed and Stimulate Soil Biology





Reduce
Chemical,
Biological, and
Physical Stress

Cover The Soil
at all times

Grow a Living
Root 24/7

Synergize with
Diversity: Crop
Rotations and
Cover Crops

Reduce
Chemical,
Biological, and
Physical Stress

Cover The Soil
at all times

Understand
Your
Ecological
Context

Grow a Living
Root 24/7

Synergize with
Diversity: Crop
Rotations and
Cover Crops

Four Principles to Improve Soil Health

- Minimize Soil Disturbance



Four Principles to Improve Soil Health

- Minimize Soil Disturbance
- Keep the Soil Covered at all Times



Four Principles to Improve Soil Health

- Minimize Soil Disturbance
- Keep the Soil Covered at all Times
- Keep Living Roots in the Soil



Four Principles to Improve Soil Health

- Minimize Soil Disturbance
- Keep the Soil Covered at all Times
- Keep Living Roots in the Soil
- Maximize Diversity



USDA-NRCS Funding Opportunities



Questions???



The United States Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.