

# TEN WAYS THAT COVER CROPS ENHANCE SOIL HEALTH



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What's happening underneath our feet?

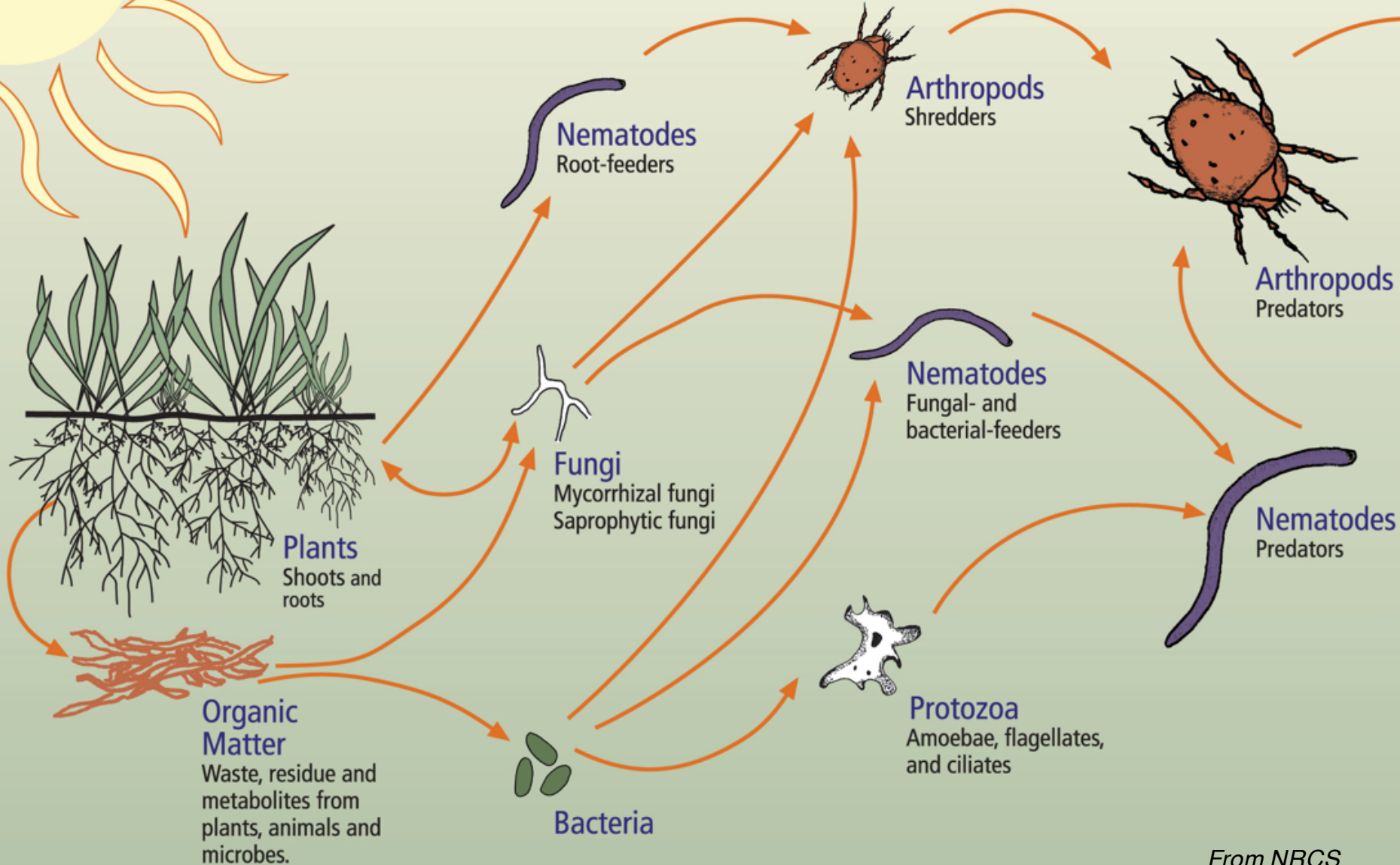
*Photo credit – Edwin Remsburg*

# #1 Cover crops feed the soil food web



*Credit: NPR.org*

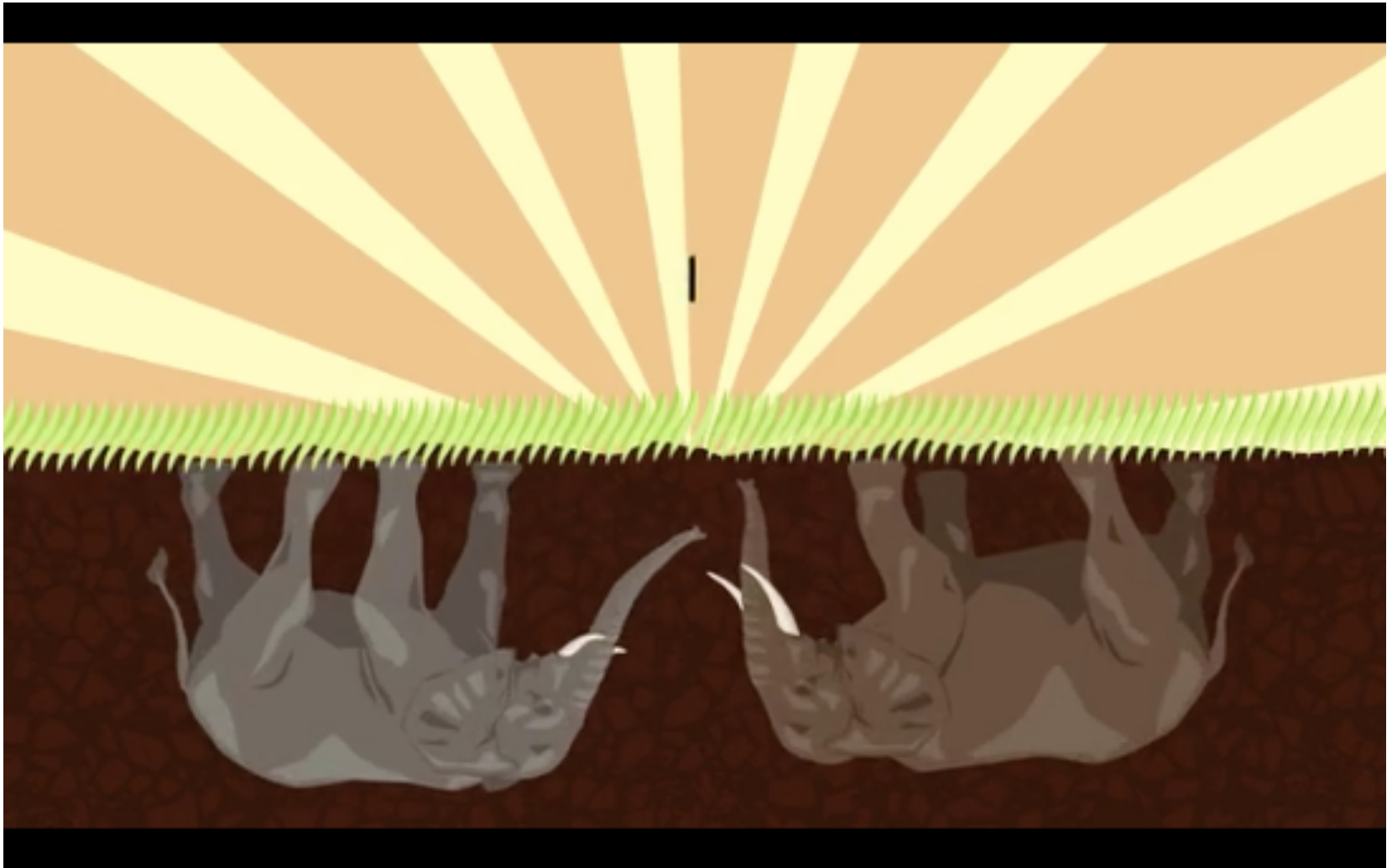
# The Soil Food Web



When there are no living roots,  
soil organisms go short on food



*“Feeding all the soil organisms below ground in one acre is like feeding two African elephants.” Jerry Hatfield, USDA-ARS*



*Credit: Soil Health Institute, Illustrator: Chelsea Wright*

Can we harvest solar energy with cover crops an extra 7-8 months of the year to feed the soil?

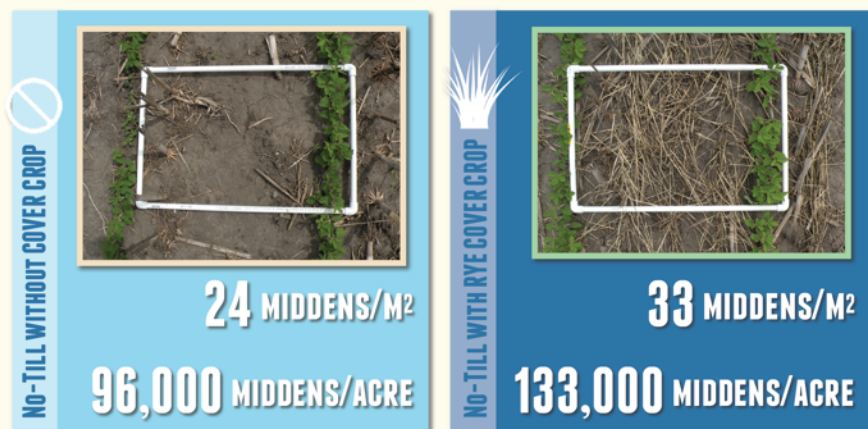


*Revitalizationnews.com*

# #2 Cover crops increase earthworms

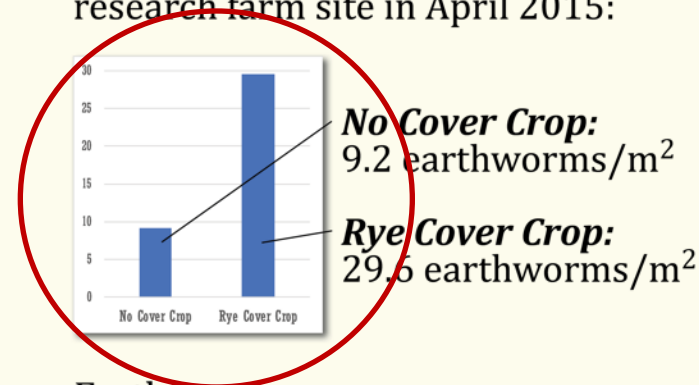
## EARTHWORMS & SOIL HEALTH

Middens of *Lumbricus terrestris* (common nightcrawler) were counted at rye sites (5 on-farm and 1 research farm) in June 2016:



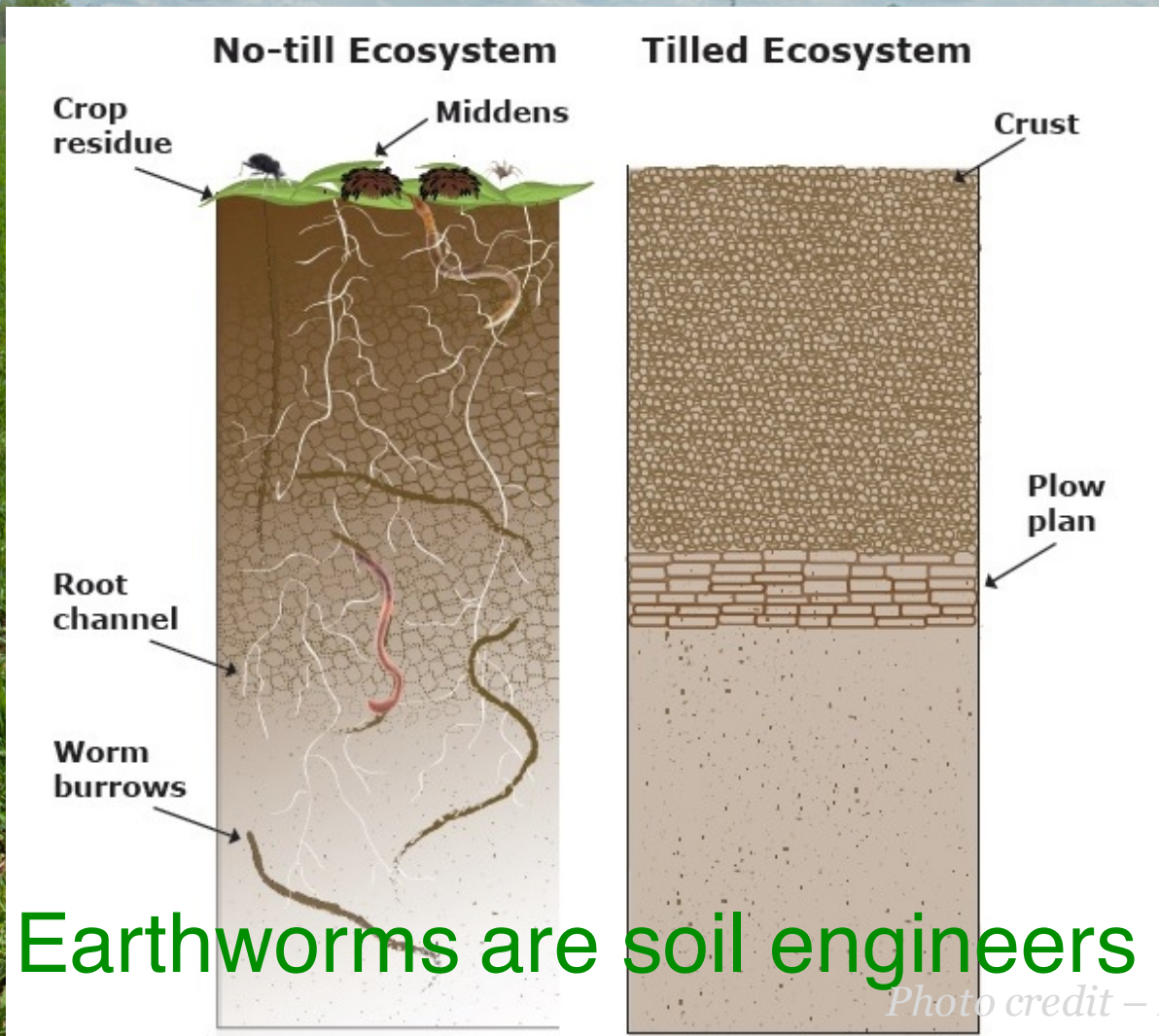
Across all sites (with rye for 7+ years),  
**38% MORE EARTHWORMS WERE PRESENT**  
WITH A CEREAL RYE COVER CROP compared to strips without cover crop.

These midden counts are consistent with earthworms counts (*L. terrestris* and *Aporrectodea* spp.) conducted via electrical extraction at the same research farm site in April 2015:



Earthworms are a  
**TANGIBLE, EARLY BIOLOGICAL INDICATOR**  
**OF SOIL HEALTH!**





Earthworms are soil engineers

Photo credit – Edwin Remsburg

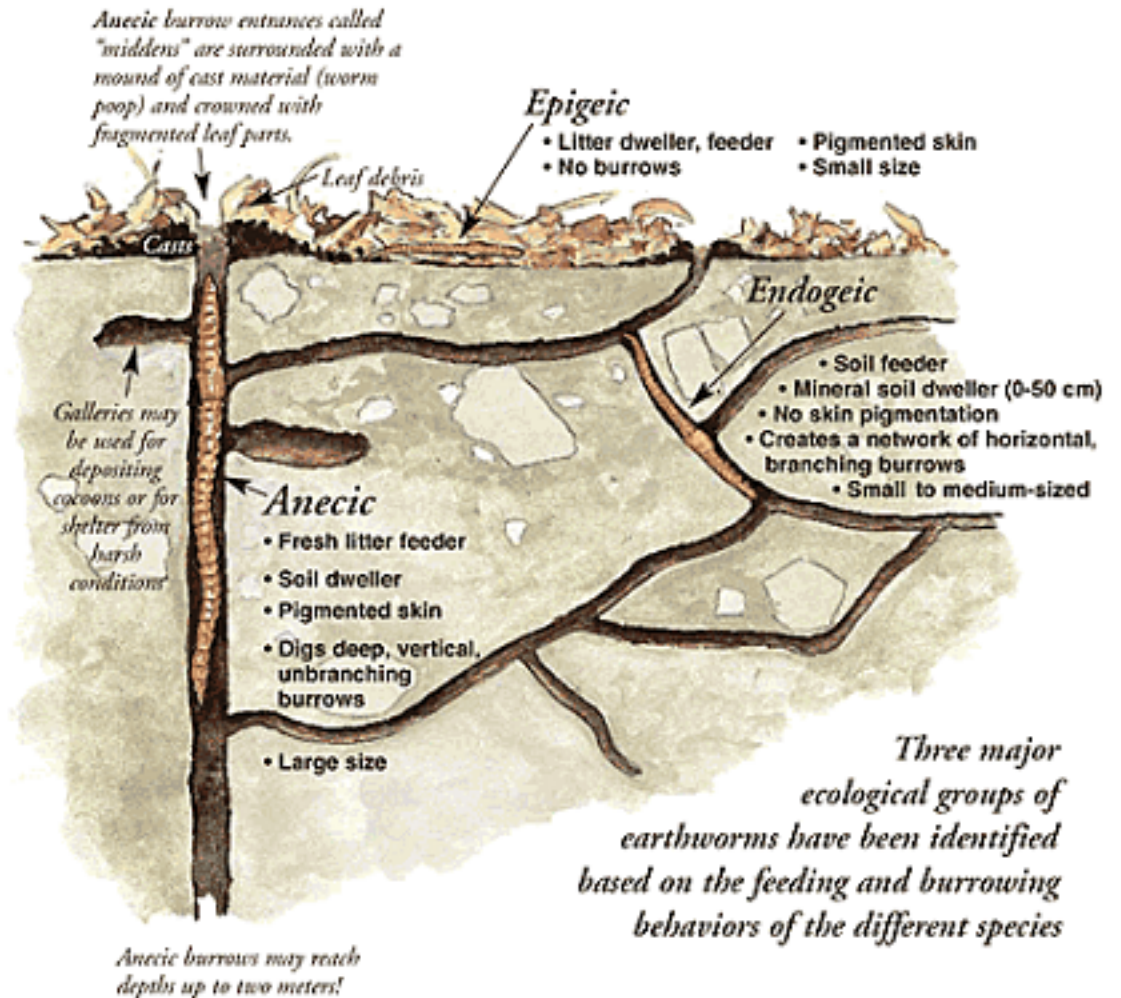
# WORM TYPES

Nightcrawlers  
(anecic)

Red worms  
(epigeic)

Pale/gray worms  
(endogeic)

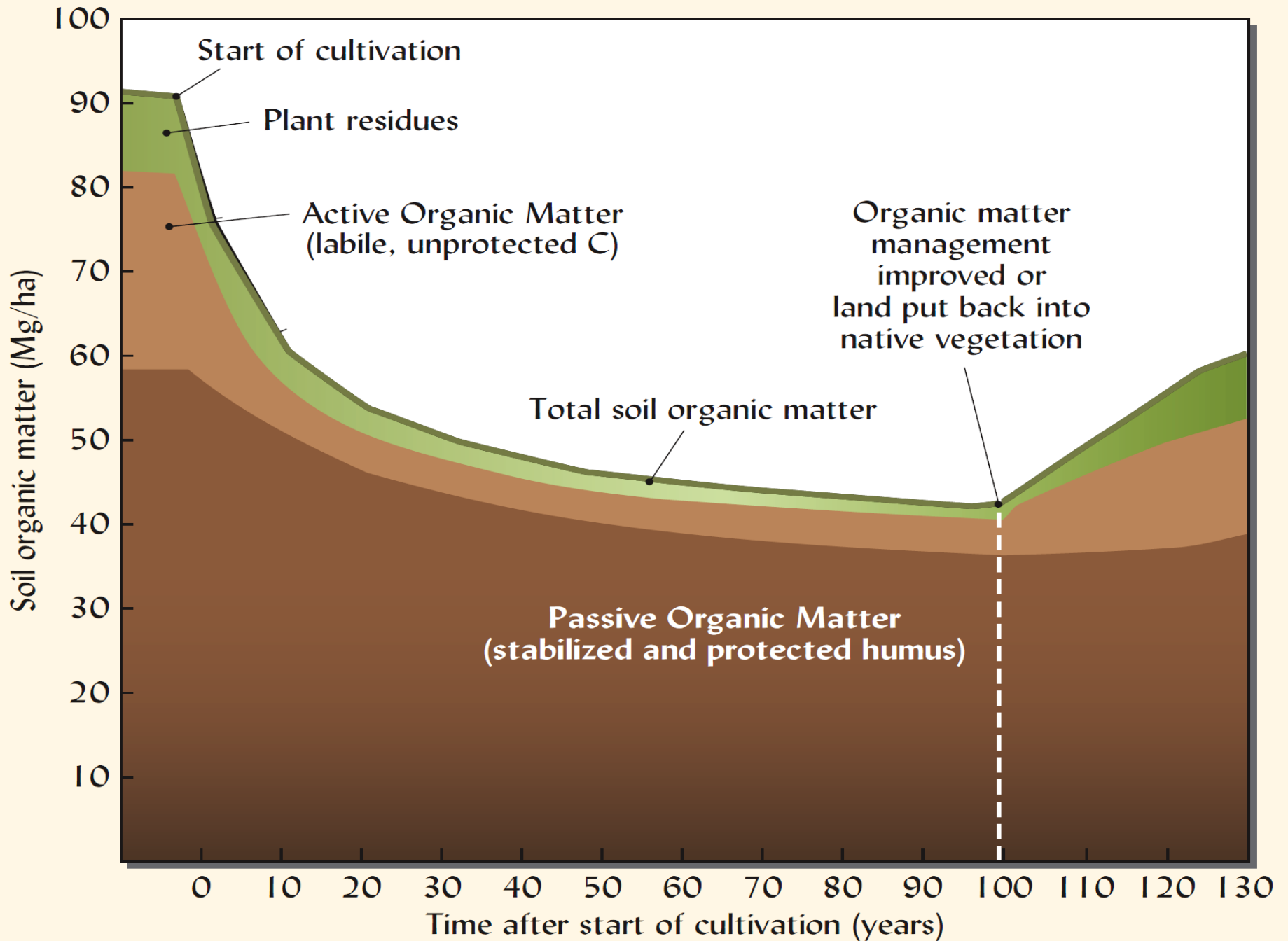
## EARTHWORMS *in the* ECOSYSTEM



## #3 Cover crops build soil carbon and organic matter



**Restoring  
soil carbon**



# Soil organic matter



Brick = high bulk density,  
low pore space



Sponge = low bulk density,  
high pore space

wmearthcare.com

- Soil water holding capacity
- Feeds soil organisms
- Supply of crop nutrients
- Improves crop rooting



www.smarthacks.tv

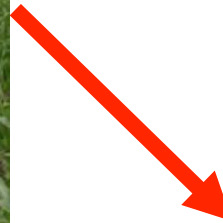
## #4 Cover crops help manage soil nutrients



# Nitrogen input – output model



Get a bushel of corn for every pound of nitrogen fertilizer applied

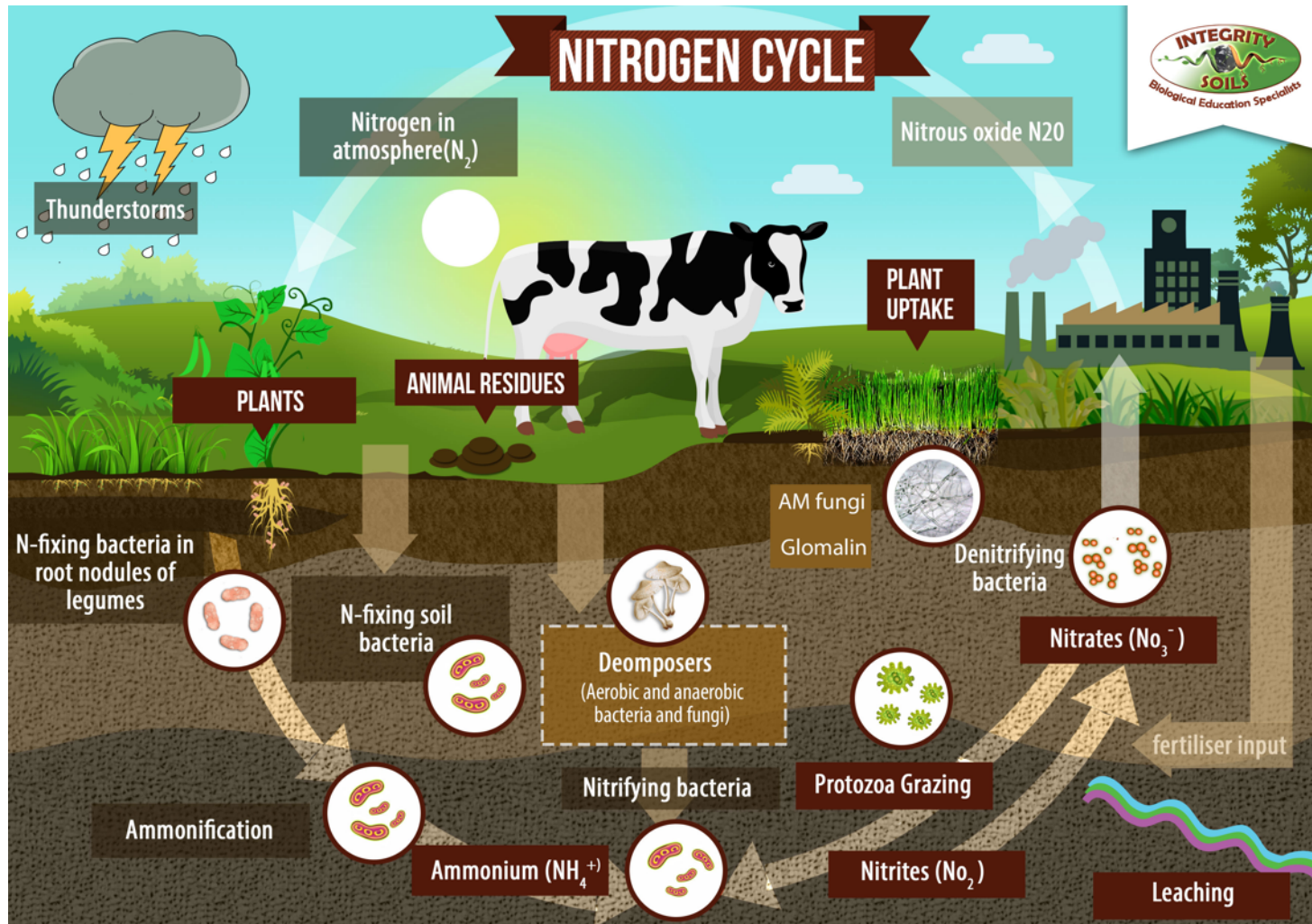


[www.cornandsoybeandigest.com](http://www.cornandsoybeandigest.com)



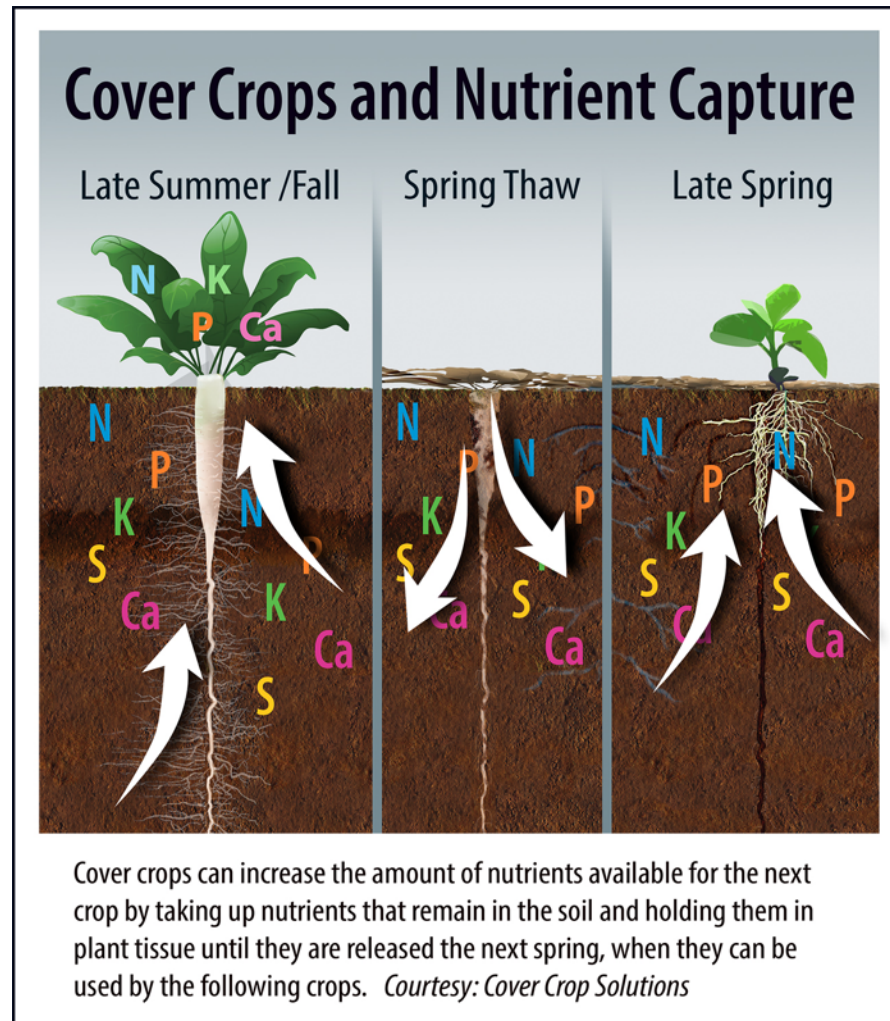
[www.farmfutures.com](http://www.farmfutures.com)

# Nitrogen impacted by soil microbes





# Scavenging nutrients



# #5 Cover crops keep the soil covered



*Photo credit – Edwin Remsburg*

# Cereal rye mulch layer in soybeans





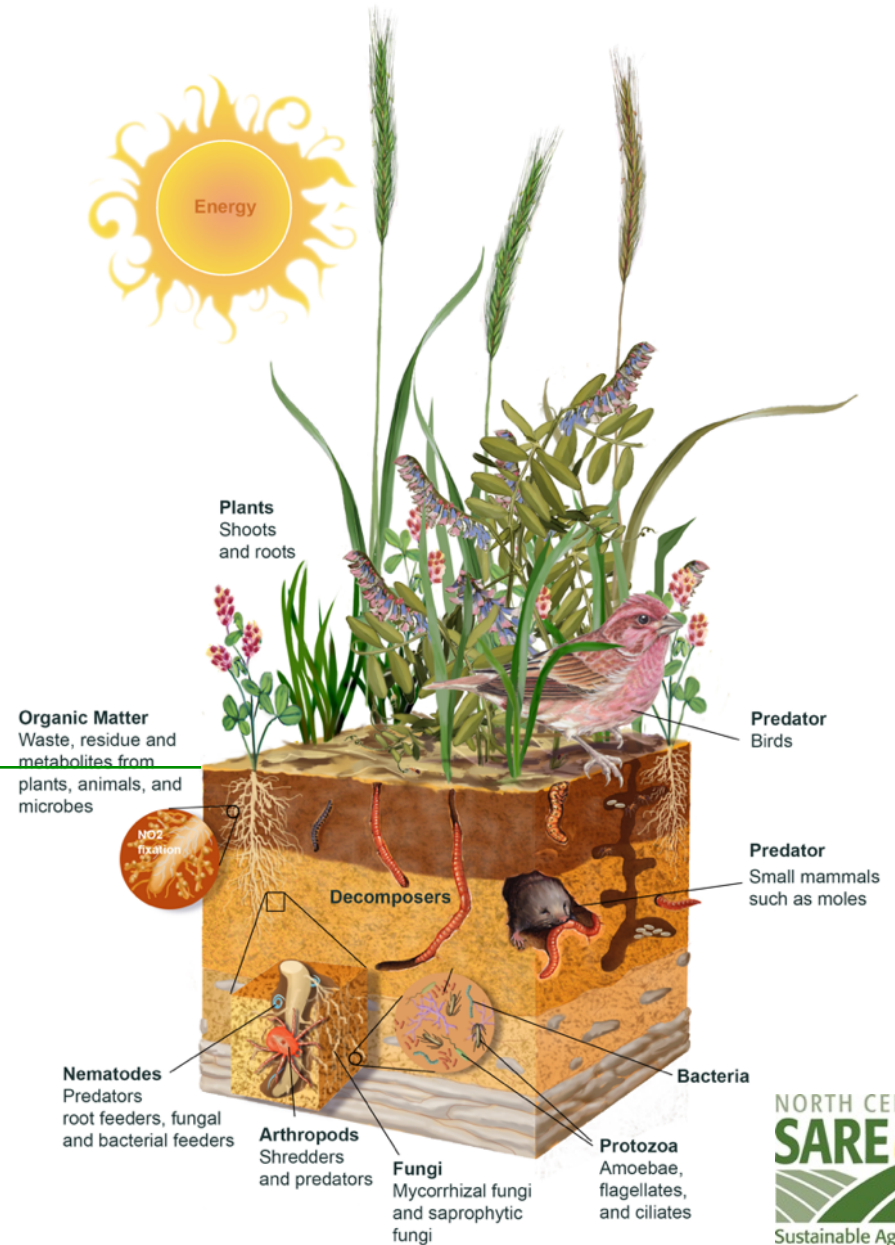
# #6 Cover crops add biodiversity

ABOVE GROUND

*and more importantly*



BELOW GROUND



# Crimson clover, hairy vetch, and rye



## Extension of Corn Root Surface Area through Mycorrhizal Fungi



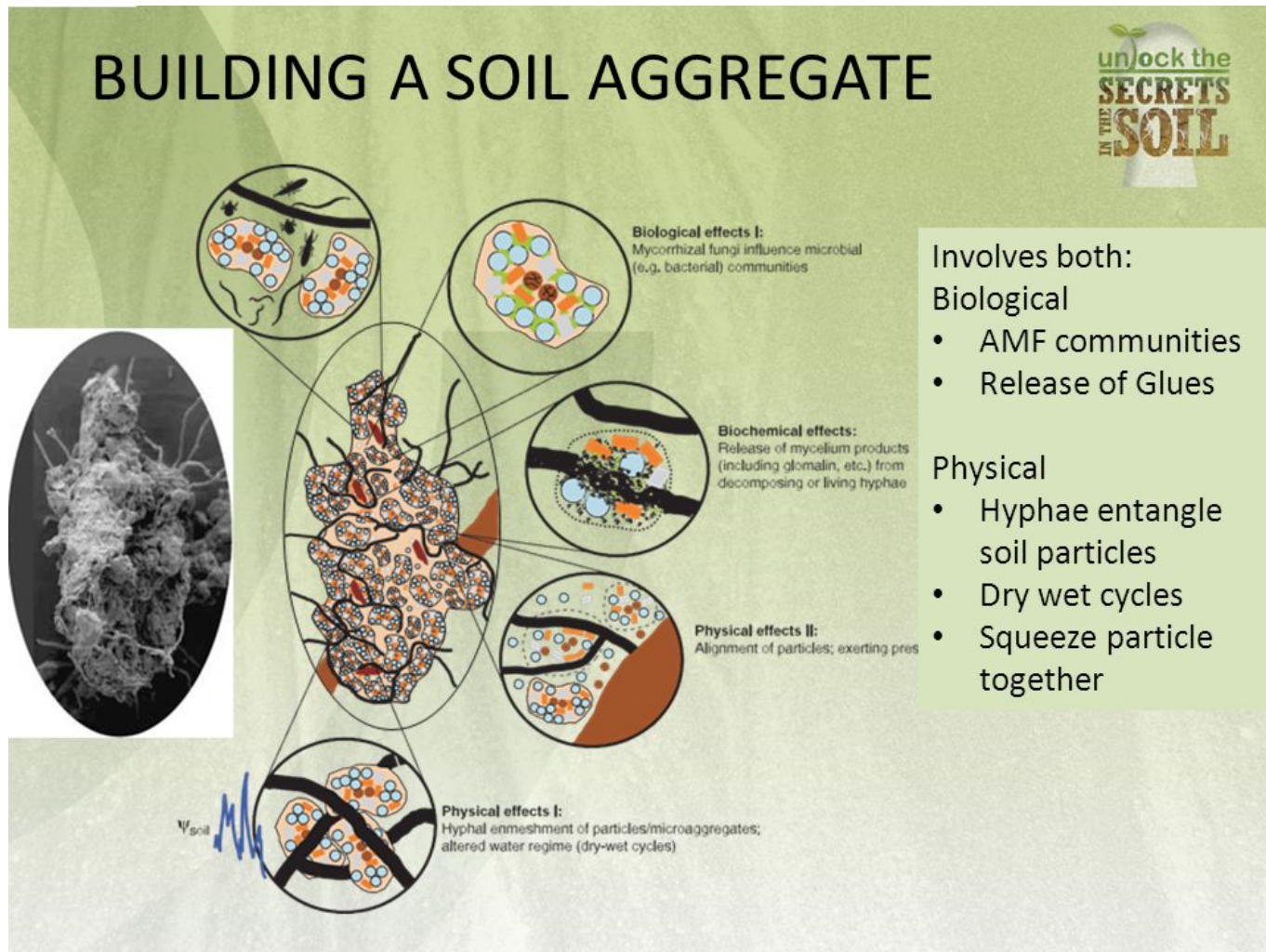




# #8 Cover crops reduce compaction



# Soil aggregates = Soil building blocks



# Which is less expensive?



# #9 Cover crops support integration of livestock with row crops



# Soils developed with herbivores



# Cover crops can be very high quality forage



*Jim Isermann farm, Illinois – Photo credit: Progressive Forage*

# #10 Cover crops help stop erosion



*Photo credit: Edwin Remsburg*

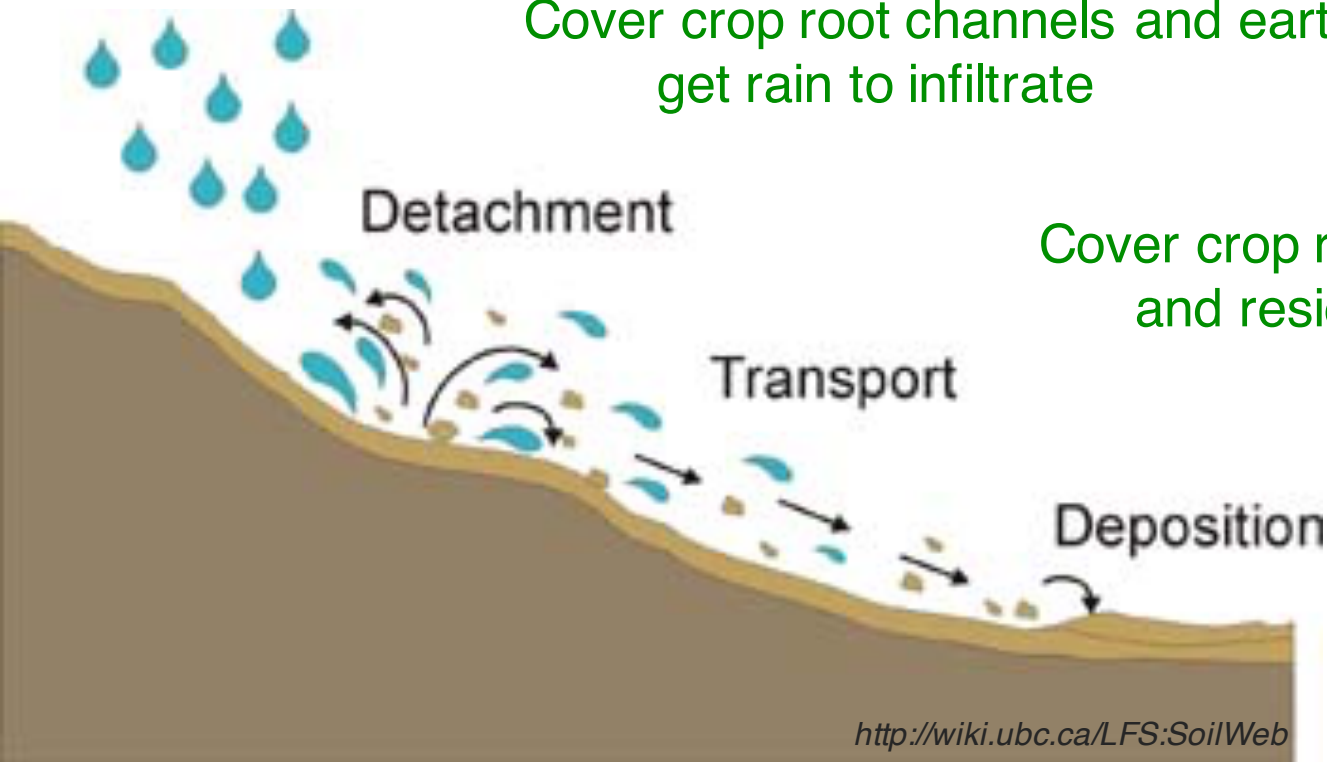
# Cover crop impact on water erosion



USDA-ARS

Living and dead cover crop leaves and stems intercept raindrops

Cover crop root channels and earthworm tunnels get rain to infiltrate



Cover crop roots anchor the soil and residue in place



# Cover crop impact on wind erosion



*Photo credit: Bruce MacKellar, Michigan State Univ.*

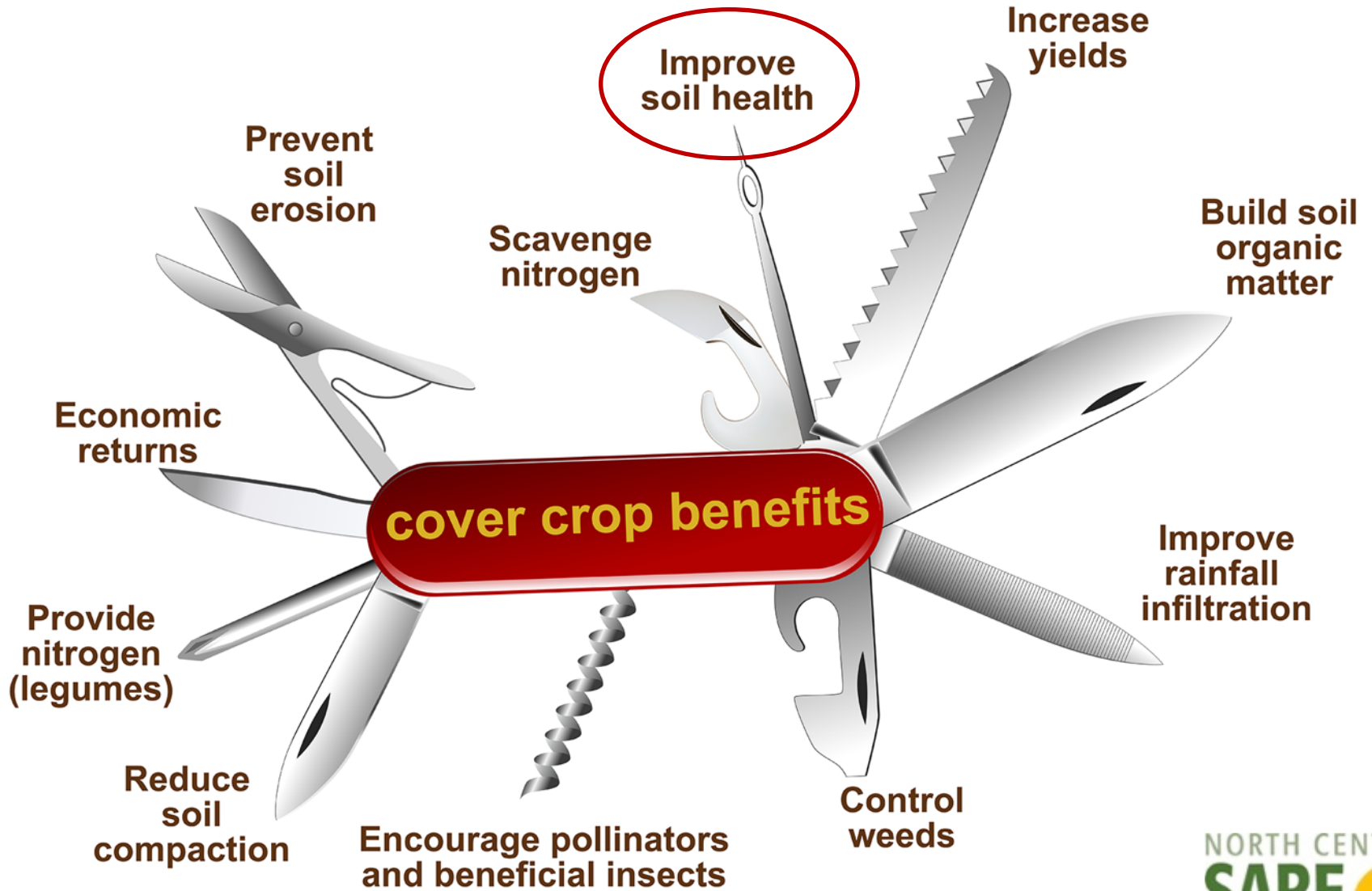


# Erosion connection to soil health



**MOST INTENSE BIOLOGICAL ACTIVITY NEAR THE SURFACE**

**MOST NUTRIENTS AND ORGANIC MATTER NEAR SURFACE**





C13

110th St

C13

110th St

T63

T63



*Lancaster County, PA  
Photo credit: Steve Groff*



# BUILDING SOIL HEALTH

*Photo credit: Edwin Remsburg*