Ten Ways that Cover Crops Enhance Soil Health

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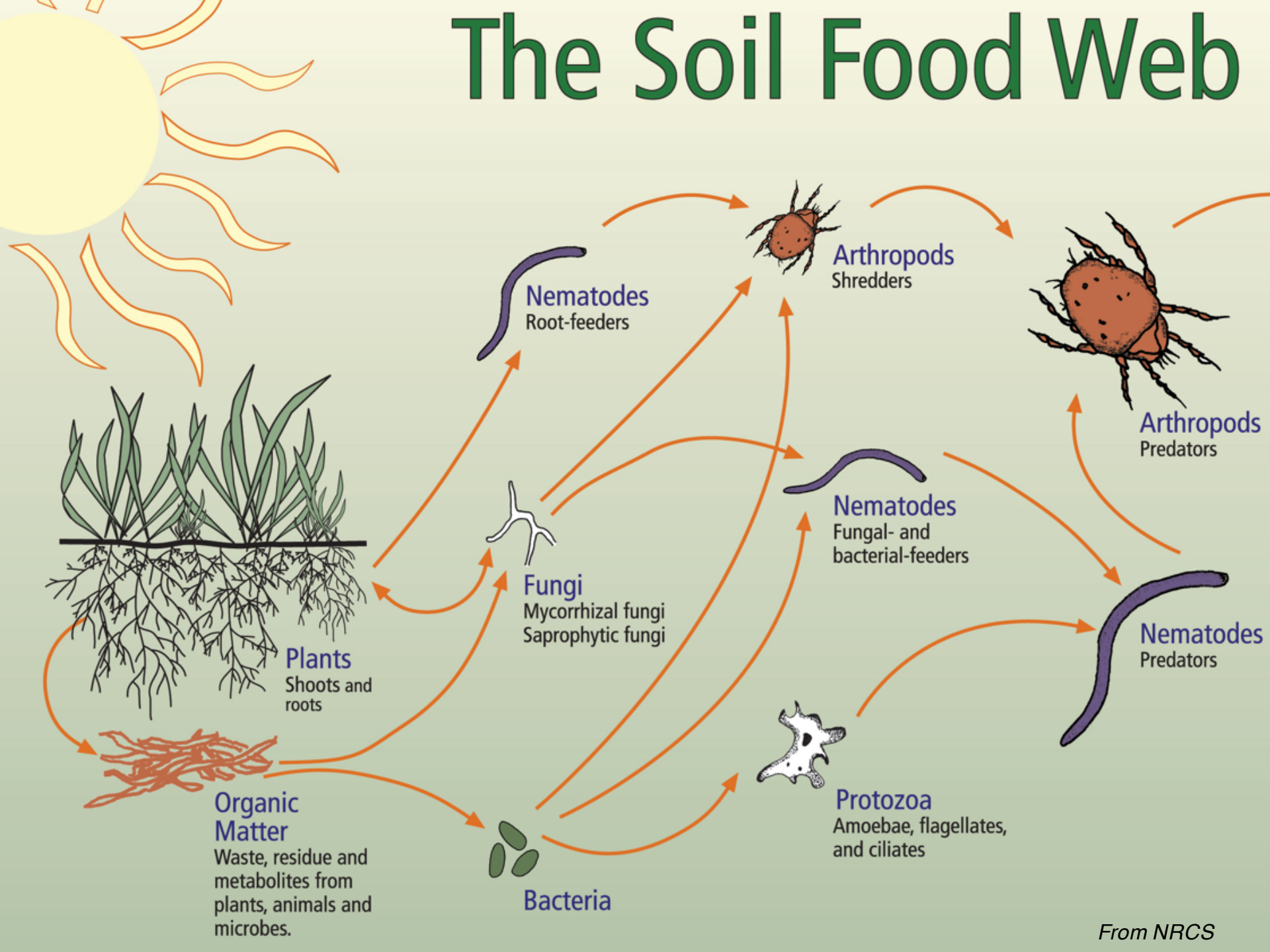
Sustainable Agriculture Research & Education

What’s happening underneath our feet?
Photo credit – Edwin Remsburg

#1 Cover crops feed the soil food web

Credit: NPR.org

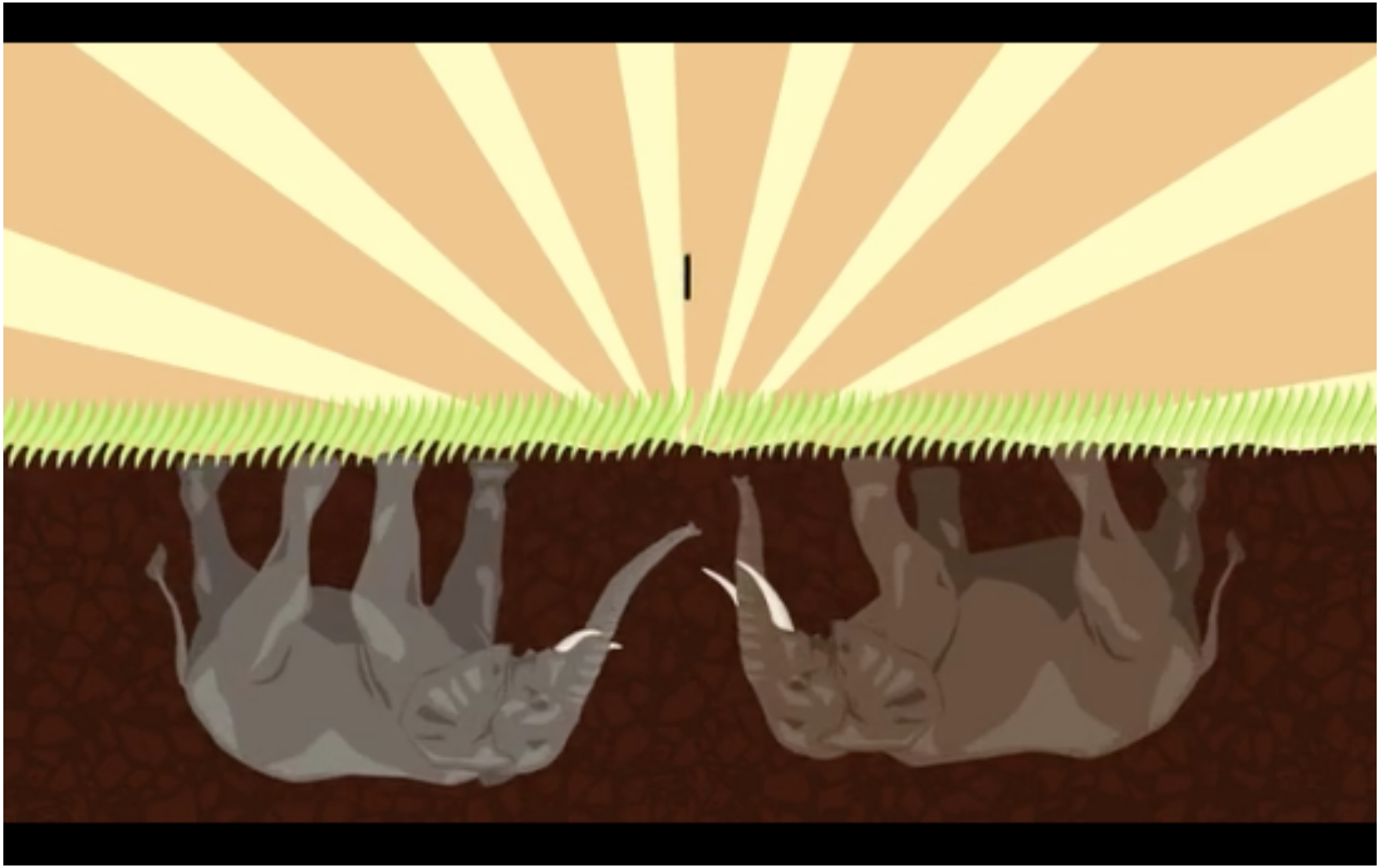
The Soil Food Web



From NRCS

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



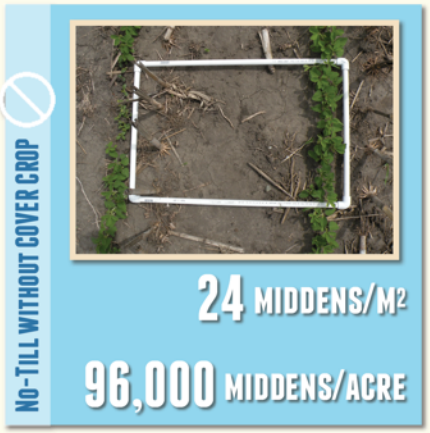
Credit: Soil Health Institute, Illustrator: Chelsea Wright

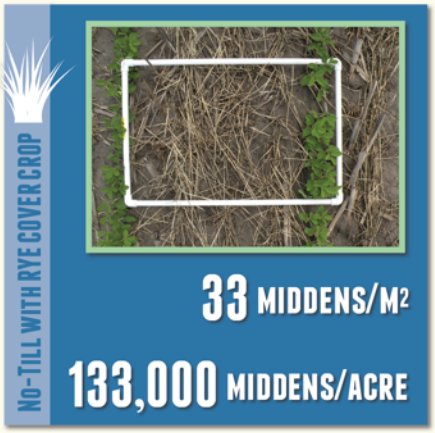
Can we harvest solar energy with cover crops an extra 7-8 months of the year to feed the soil?

#2 Cover crops increase earthworms

EARTHWORMS & SOIL HEALTH

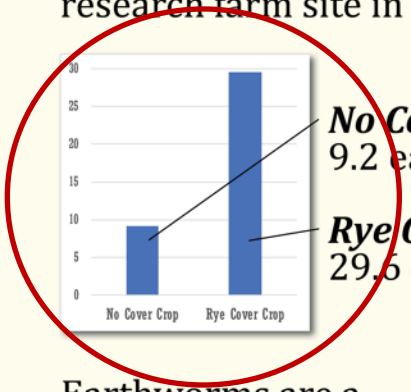
Middens of *Lumbricus terrestris* (common nightcrawler) were counted at rye sites (5 on-farm and 1 research farm) in June 2016:





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:

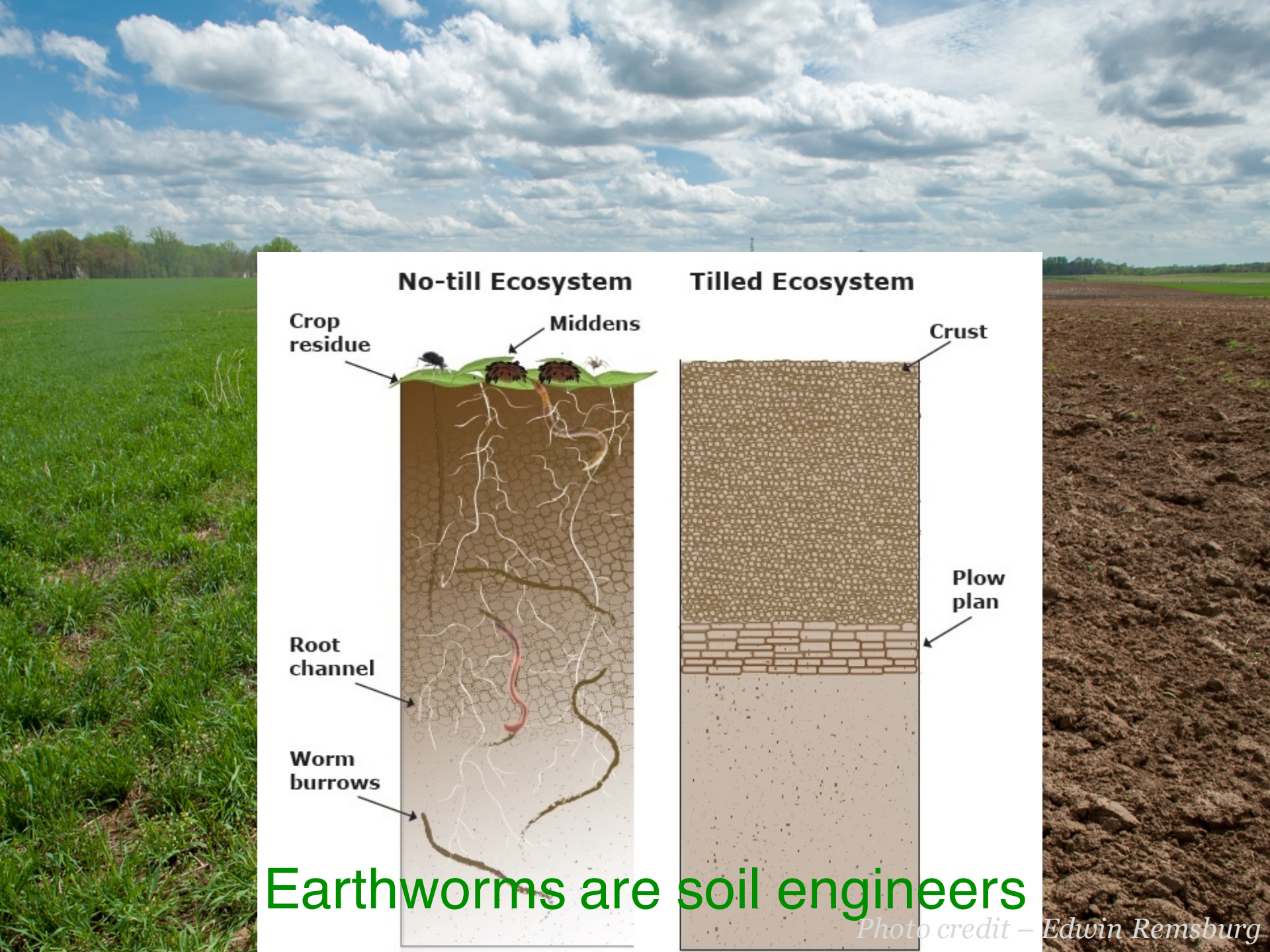


No Cover Crop:
9.2 earthworms/m^2

Rye Cover Crop:
29.6 earthworms/m^2

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

Iowa Learning Farms



Earthworms are soil engineers

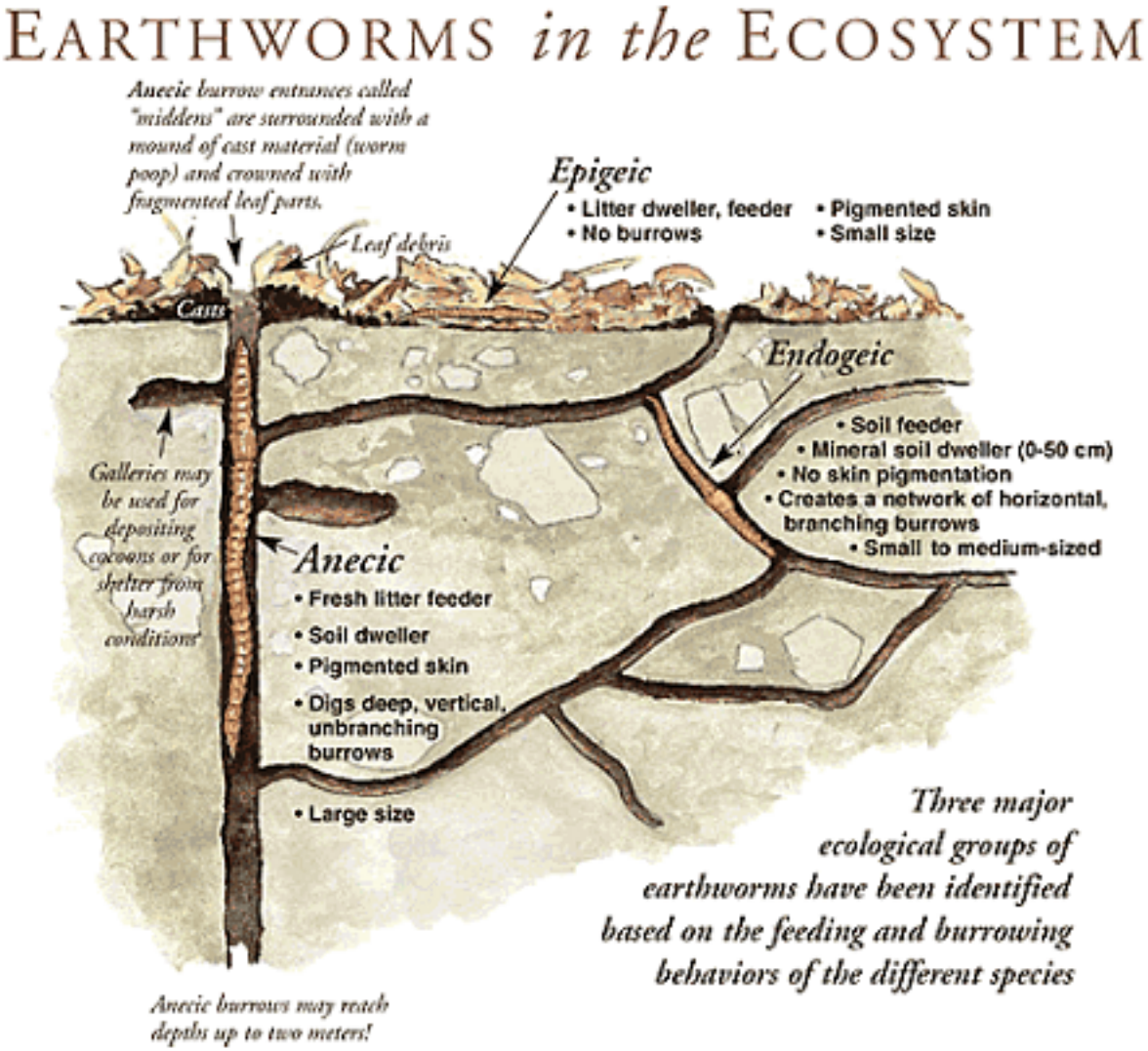
Photo credit – Edwin Remsburg

WORM TYPES

Nightcrawlers (anecic)

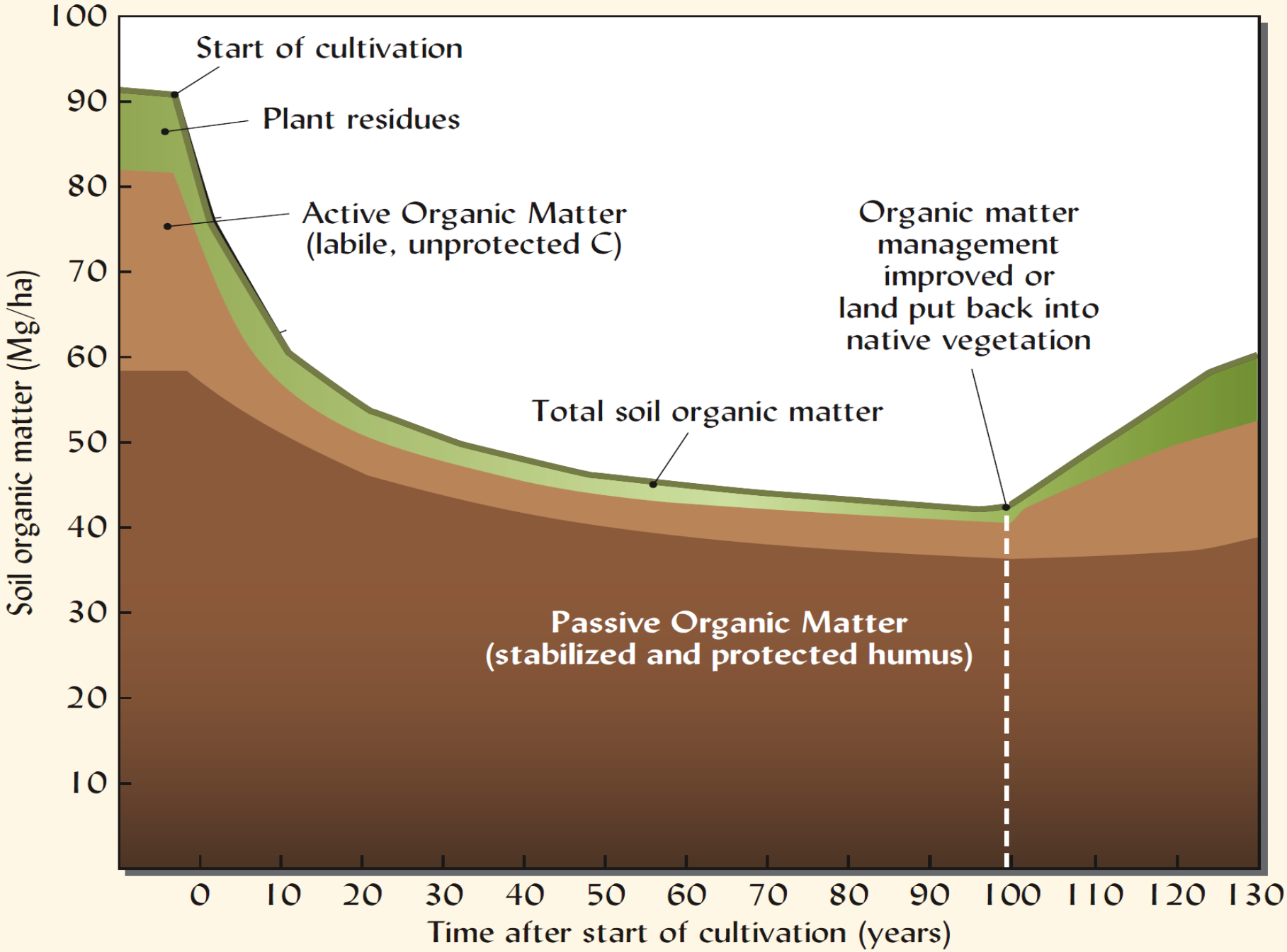
Red worms (epigeic)

Pale/gray worms (endogeic)



http://ecoserv.weebly.com/worms.html

#3 Cover crops build soil carbon and organic matter



From: Weil and Brady. 2017. *The Nature and Properties of Soils*. 15th edition. Pearson.

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

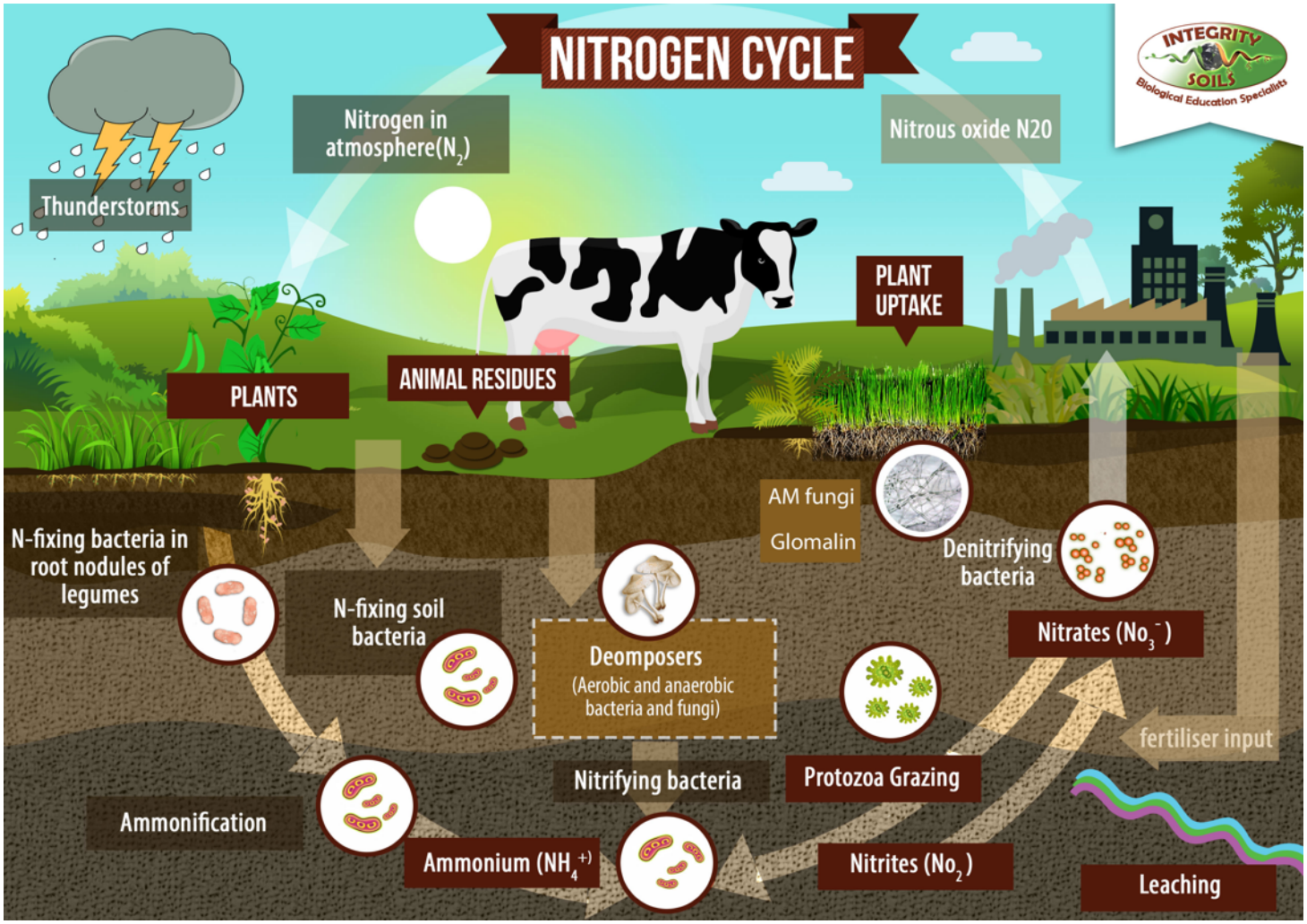
Nitrogen input – output model

www.cornandsoybeandigest.com

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

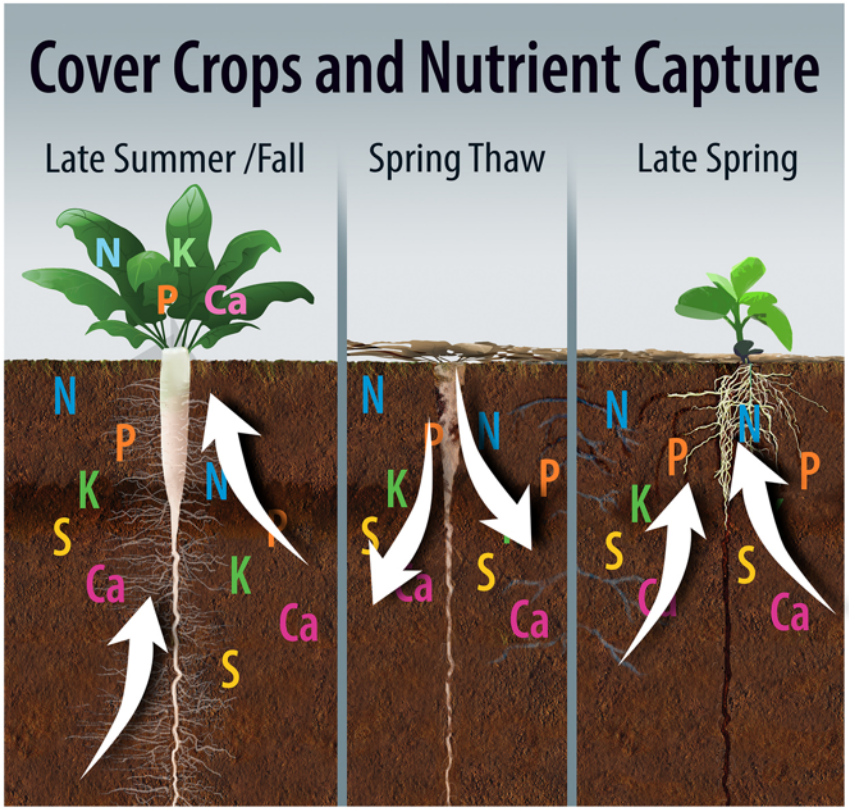
www.farmfutures.com

Nitrogen impacted by soil microbes



www.integritysoils.co.nz

Scavenging nutrients



Cover crops can increase the amount of nutrients available for the next crop by taking up nutrients that remain in the soil and holding them in plant tissue until they are released the next spring, when they can be used by the following crops. *Courtesy: Cover Crop Solutions*

#5 Cover crops keep the soil covered

Photo credit – Edwin Remsburg

Cereal rye mulch layer in soybeans

Prairieview.mustangsps.org

#6 Cover crops add biodiversity

ABOVE GROUND

and more importantly

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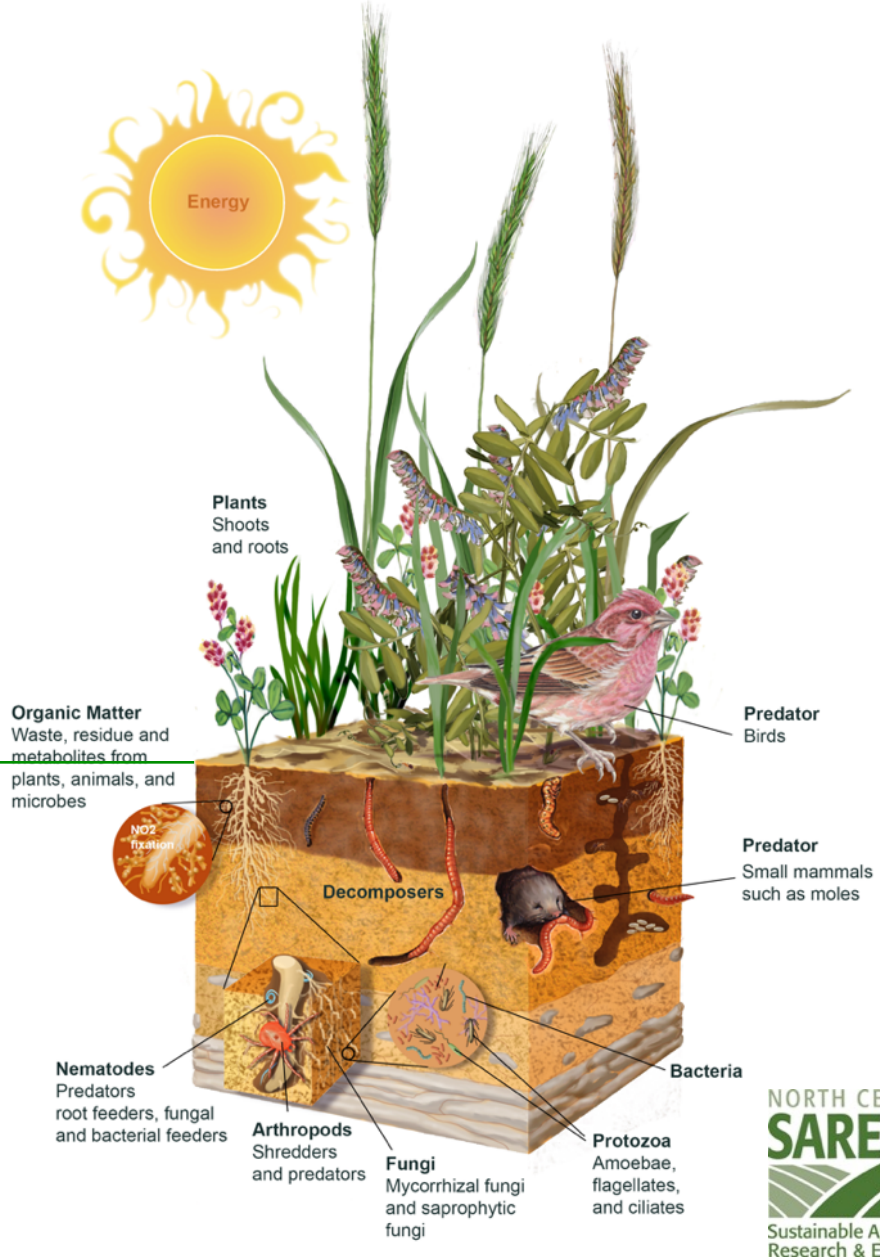
BELOW GROUND



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Crimson clover, hairy vetch, and rye

Extension of Corn Root Surface Area through Mycorrhizal Fungi

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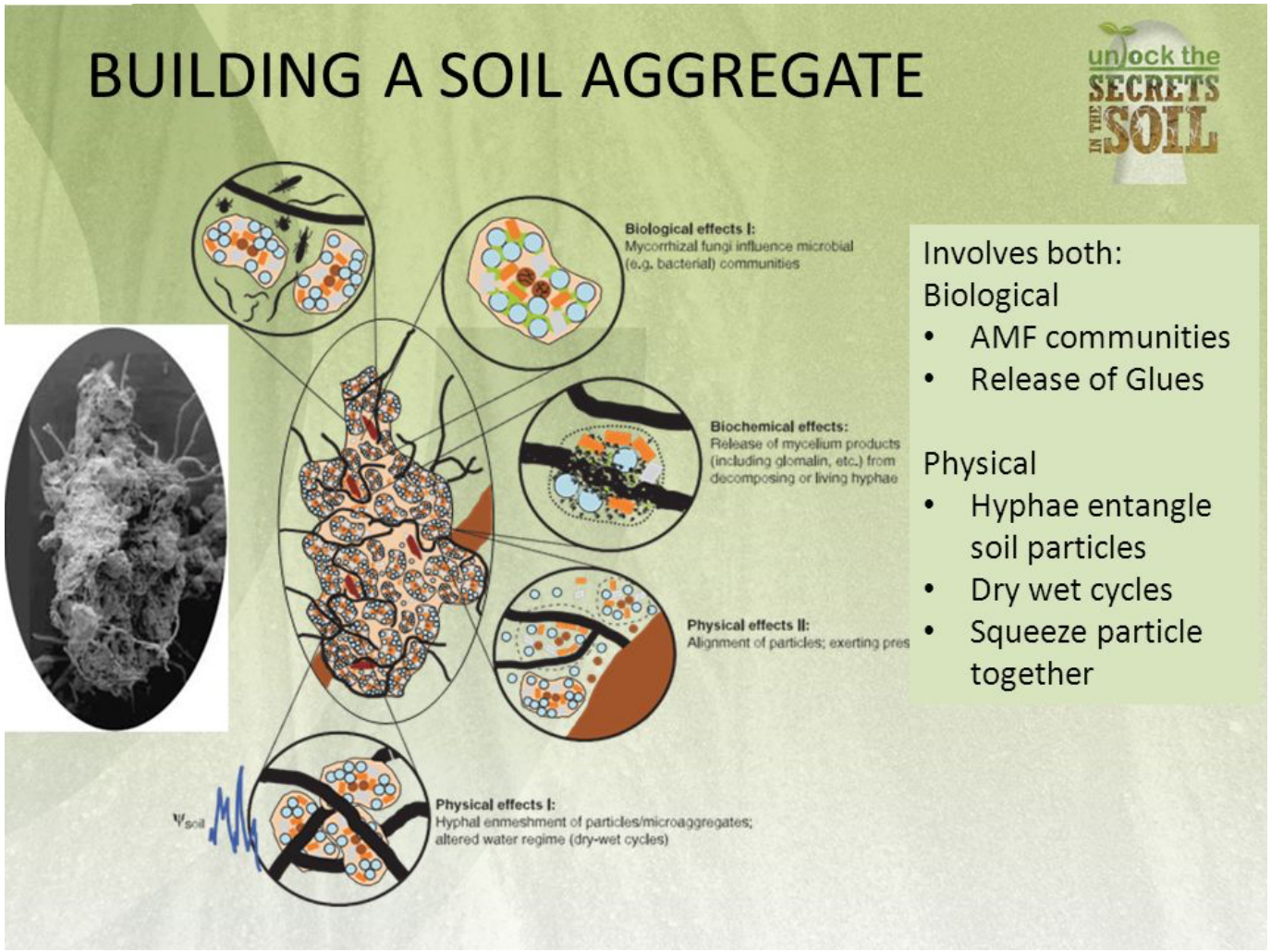
#8 Cover crops reduce compaction

Indiana Prairie Farmer

Soil aggregates = Soil building blocks



From NRCS

Which is less expensive?

#9 Cover crops support integration of livestock with row crops

Soils developed with herbivores

Missouri Ruralist

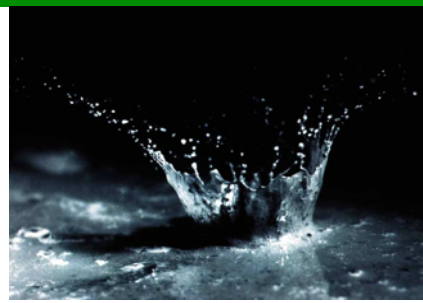
Cover crops can be very high quality forage

Jim Isermann farm, Illinois – Photo credit: Progressive Forage

#10 Cover crops help stop erosion

Photo credit: Edwin Remsburg

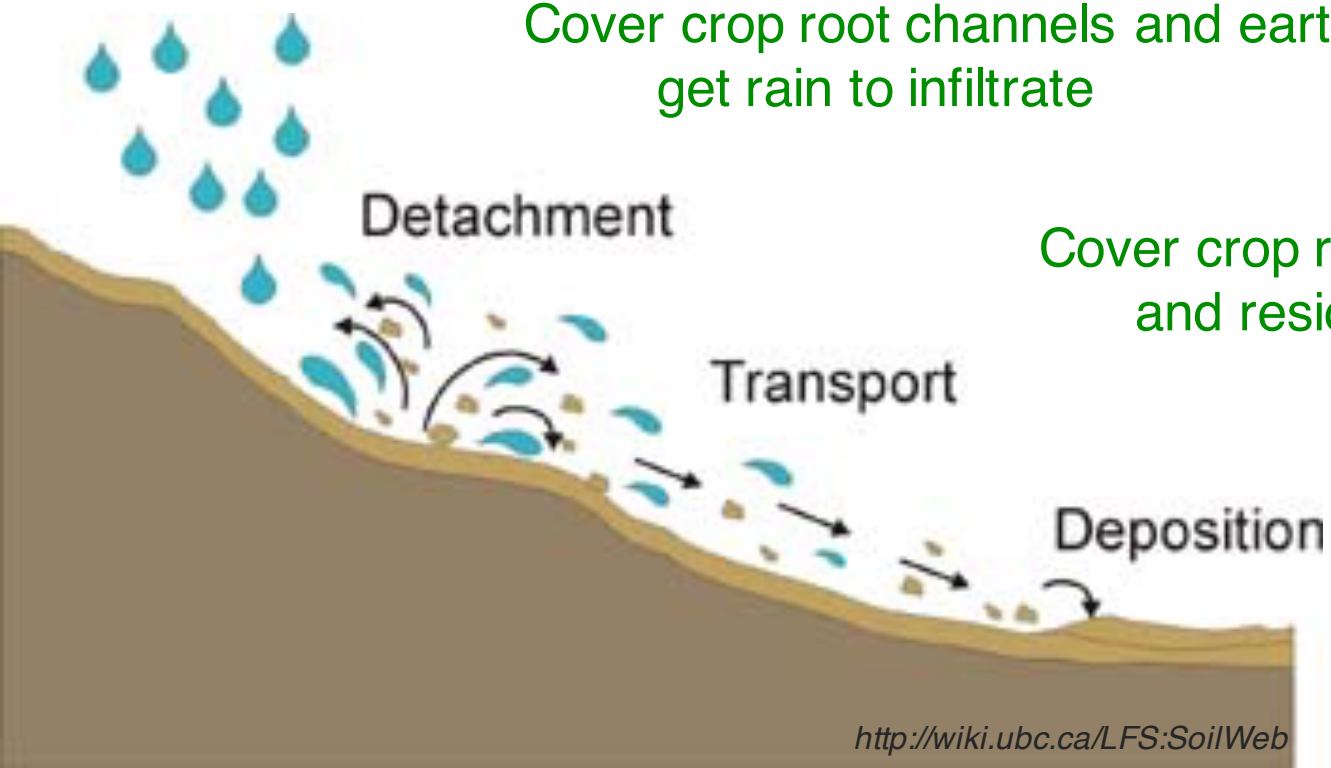
Cover crop impact on water erosion



USDA-ARS

Living and dead cover crop leaves and stems intercept raindrops

Cover crop root channels and earthworm tunnels get rain to infiltrate



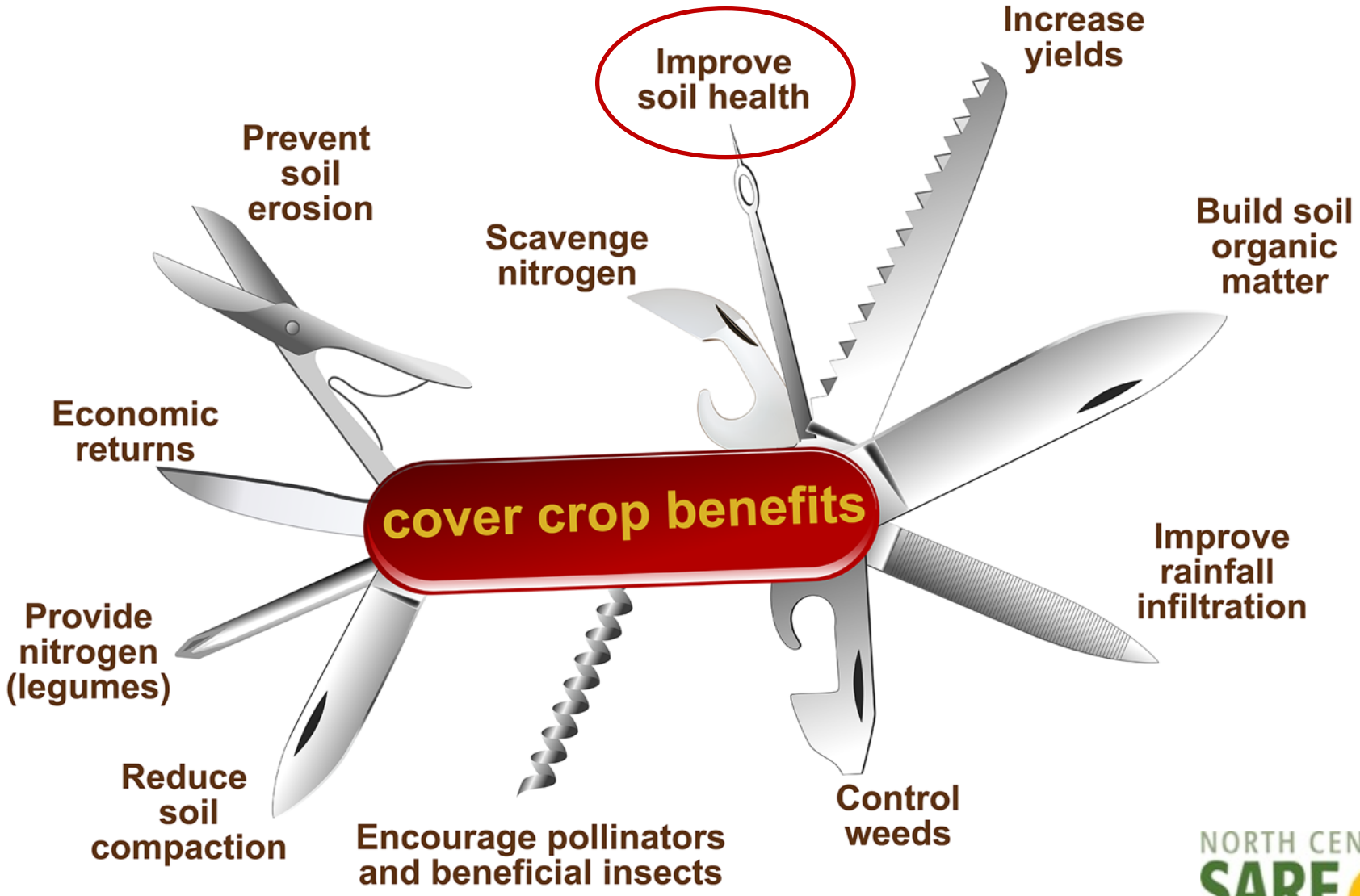
Cover crop roots anchor the soil and residue in place

http://wiki.ubc.ca/LFS:SoilWeb

Cover crop impact on wind erosion

Photo credit: Bruce MacKellar, Michigan State Univ.

Erosion connection to soil health



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Lancaster County, PA
Photo credit: Steve Groff

Photo credit: Edwin Remsburg