

Hugh Hammond Bennett



Soil scientist and showman

From “Soil Erosion: A National Menace (1928)

“What would be the feeling of this Nation should a foreign nation suddenly enter the United States and destroy 90,000 acres of land, as erosion has been allowed to do in a single county?”

“To visualize the full enormity of land impairment and devastation brought about by this ruthless agent is beyond the possibility of the mind. An era of land wreckage destined to weigh heavily upon the welfare of the next generation is at hand.”



Out of the long list of nature's gifts
to man, none is perhaps so utterly
essential to human life as soil.

— *Hugh Hammond Bennett* —

AZ QUOTES



Hugh Hammond Bennett- The Story of Americas Private Lands Conservation Movement.mp4





Soil Conservation Act of 1935

Signed into law by President Franklin Roosevelt

The law was designed “To provide for the protection of land resources against soil erosion, and for other purposes”

Created the Soil Conservation Service (NRCS since 1994)



In 1936, the nation further refined its soil and agricultural policy with the Soil Conservation and Domestic Allotment Act, which amended the Soil Conservation Act in order to enhance federal-state coordination, discourage the over-use of land, assist tenants and sharecroppers, and help create stable and adequate prices for farm goods [8]. Roosevelt signed the law on February 29, 1936, and the next day stated: “The United States, as evidenced by the *progressive* public opinion and vigorous demand which resulted in the enactment of this law, is now emerging from its *youthful* stage of heedless exploitation and is beginning to realize the supreme importance of treating the soil well” [9].



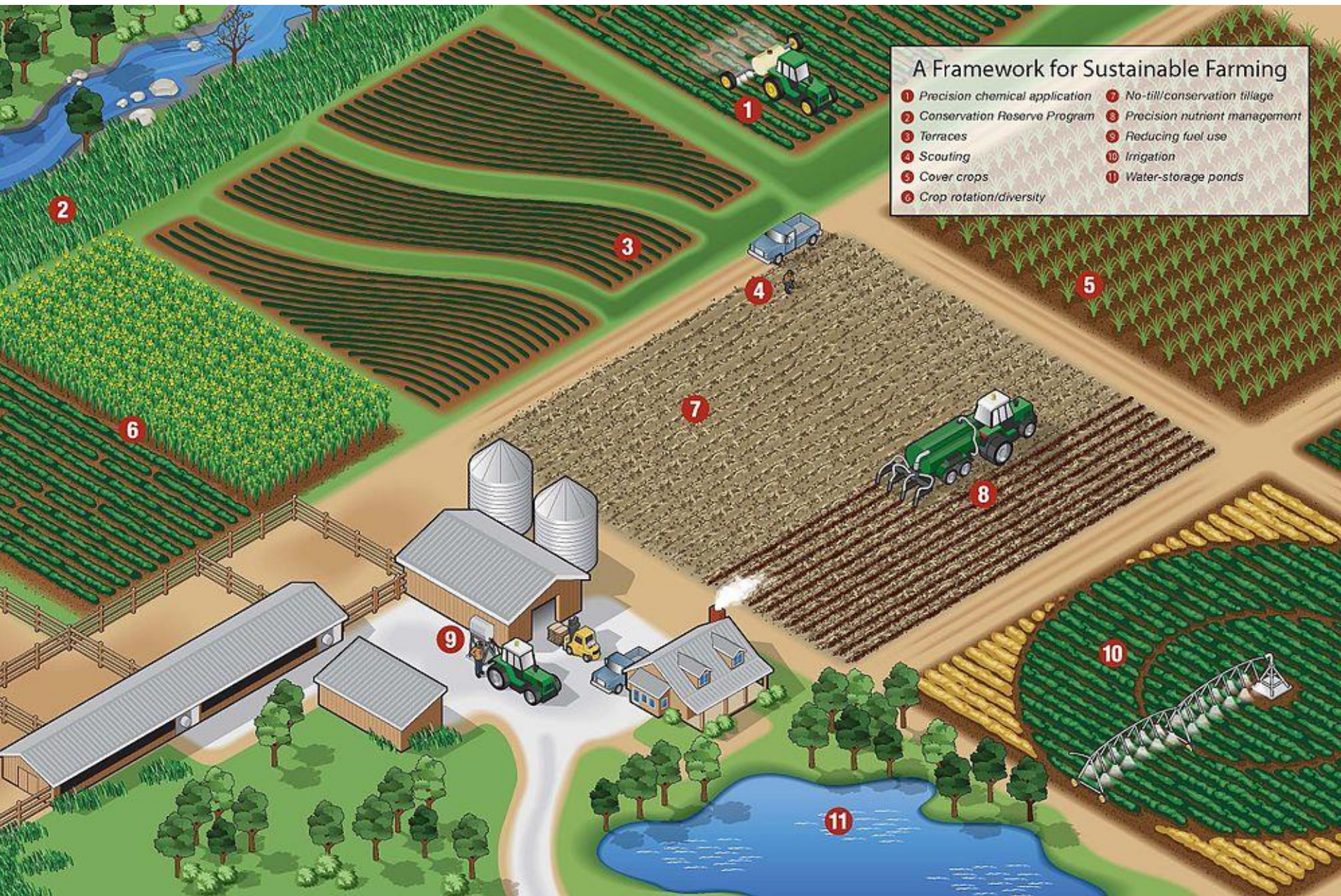
INDIANA ASSOCIATION OF
soil and water conservation
DISTRICTS



LaPorte County
Soil and Water
Conservation District

Compared to 2005, consumer demand in 2050 is estimated to drive farmers to produce:

- 80 percent more meat
- 52 percent more grain
- 40 percent more roots and tubers
- *From the Danforth Center for Plant Science*



A Framework for Sustainable Farming

- 1 Precision chemical application
- 2 Conservation Reserve Program
- 3 Terraces
- 4 Scouting
- 5 Cover crops
- 6 Crop rotation/diversity
- 7 No-till/conservation tillage
- 8 Precision nutrient management
- 9 Reducing fuel use
- 10 Irrigation
- 11 Water-storage ponds

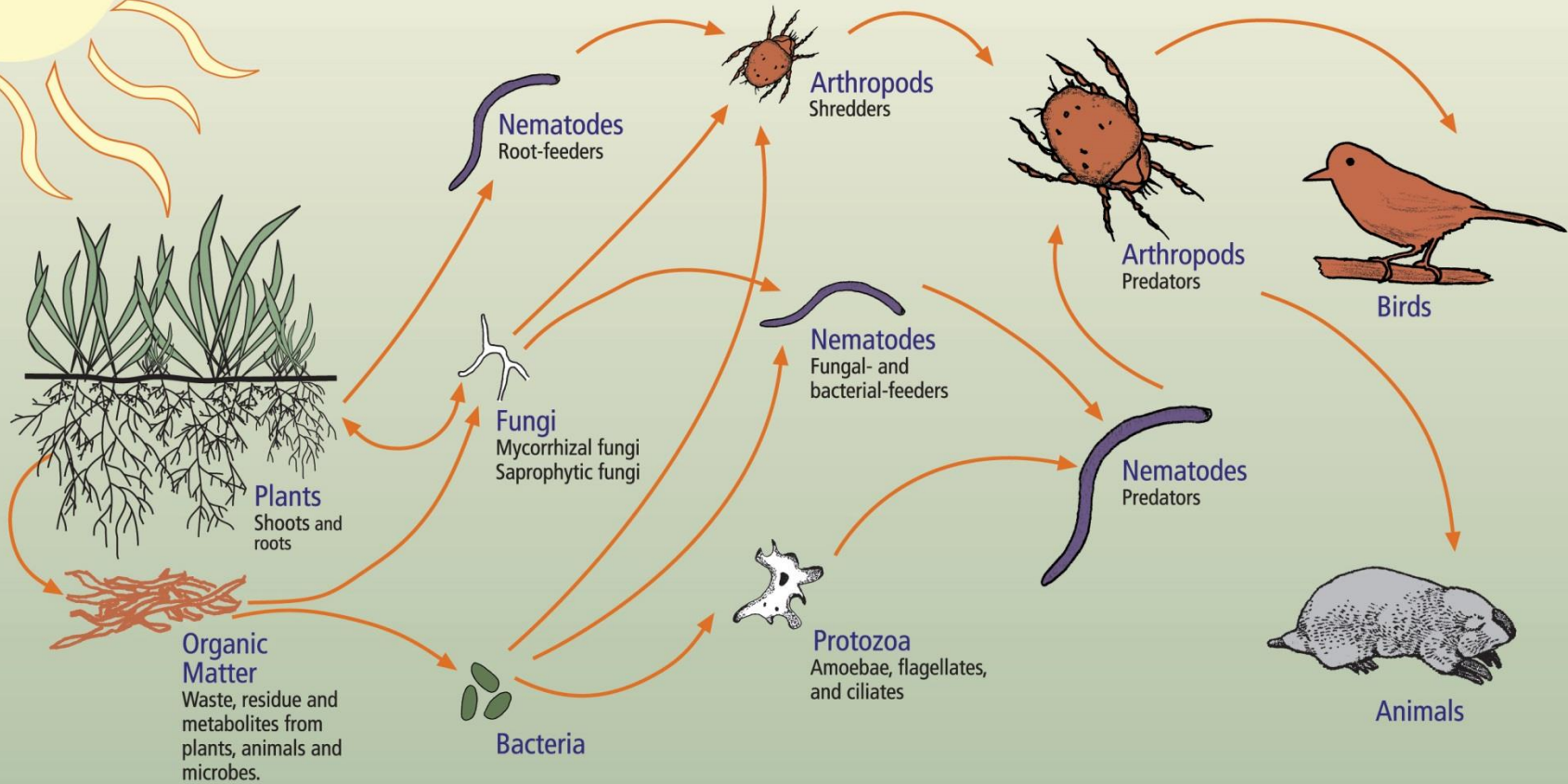
“The reality is that no single agricultural technology or farming practice will provide sufficient food for the world in 2050. Instead we must advocate for and utilize a range of these technologies in order to maximize yields.”

-Mark Rosegrant, lead author of the book and director of IFPRI's Environment and Production Technology Division.

A close-up photograph of dark, rich soil with green plants and a small white flower growing from it. The soil is the central focus, with a yellow-green wavy border at the bottom.

HEALTHY SOILS ARE:
full of life.

The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

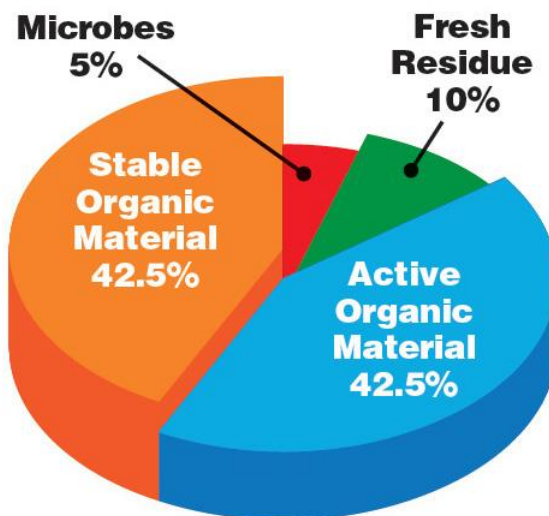
Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

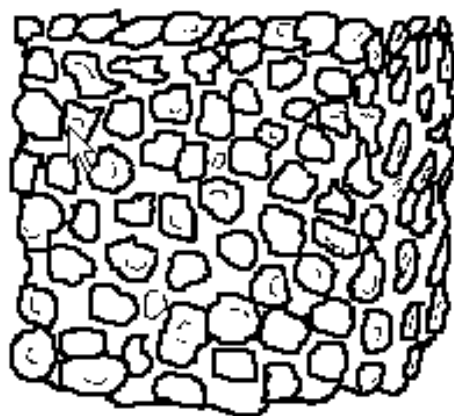
Fifth and higher trophic levels:
Higher level predators

HEALTHY SOILS ARE: *high in organic matter.*

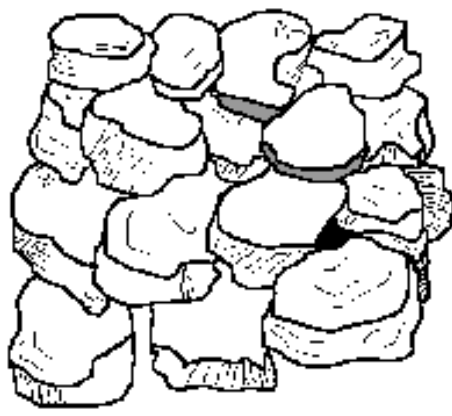
Four Components of Soil Organic Matter



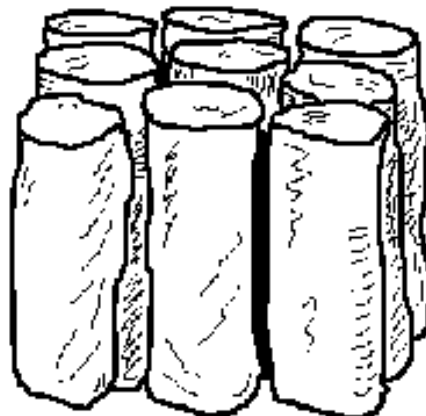
HEALTHY SOILS ARE:
well-structured.



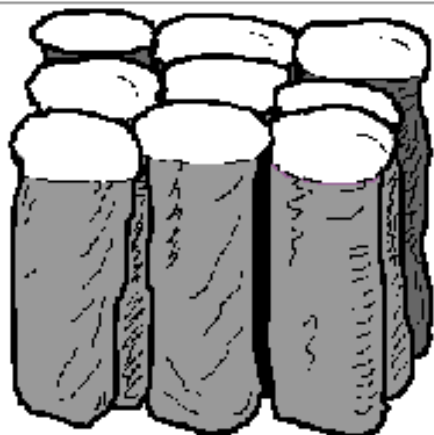
Granular: Resembles cookie crumbs and is usually less than 0.5 cm in diameter. Commonly found in surface horizons where roots have been growing.



Blocky: Irregular blocks that are usually 1.5 - 5.0 cm in diameter.



Prismatic: Vertical columns of soil that might be a number of cm long. Usually found in lower horizons.



Columnar: Vertical columns of soil that have a salt "cap" at the top. Found in soils of arid climates.



Platy: Thin, flat plates of soil that lie horizontally. Usually found in compacted soil.



Single Grained: Soil is broken into individual particles that do not stick together. Always accompanies a loose consistence. Commonly found in sandy soils.

HEALTHY SOILS ARE:
covered all the time.

DON'T FARM
NAKED



PLANT COVER CROPS





Hidden Half of Plants: Developing more robust and sustainable crops

Active Soil

RHIZOSPHERE, the area surrounding the roots, helps plants extract nutrients from the soil and increases surface area of plant root hairs

THOUSANDS of microbial species such as bacteria, fungi, protozoa, nematodes, earthworms, and arthropods thrive in the rhizosphere

There are more microbes in a teaspoon of soil than there are **PEOPLE ON THE EARTH**

Deep roots improve plants' ability to **ACCESS WATER** during drought



Microbes' Big Benefits

FENDING OFF pests and diseases

Improving access to **NUTRIENTS**

Protecting against **ENVIRONMENTAL** stress

REDUCING the need for synthetic nitrogen fertilizer

Root Interactions

Roots exude chemicals to:

-  Communicate with other roots and microbes
-  Send warning signals to neighboring plants
-  Create symbiotic relationships in the soil

Feed organisms that create and manage other nutrients

Help cycle nutrients in exchange for plant sugar

Respond to light, water, gravity and pressure from soil particles



Roots as Solutions

Regulate water management, carbohydrate and nitrogen cycling

Help crops be more resilient to unpredictable weather and climate change while increasing or maintaining yield

Sustain and develop biodiversity

Roots with increased nitrogen uptake and foraging reduce nitrogen runoff



DONALD DANFORTH
PLANT SCIENCE CENTER
BIOLOGY | GENOMICS | METABOLISM

danforthcenter.org

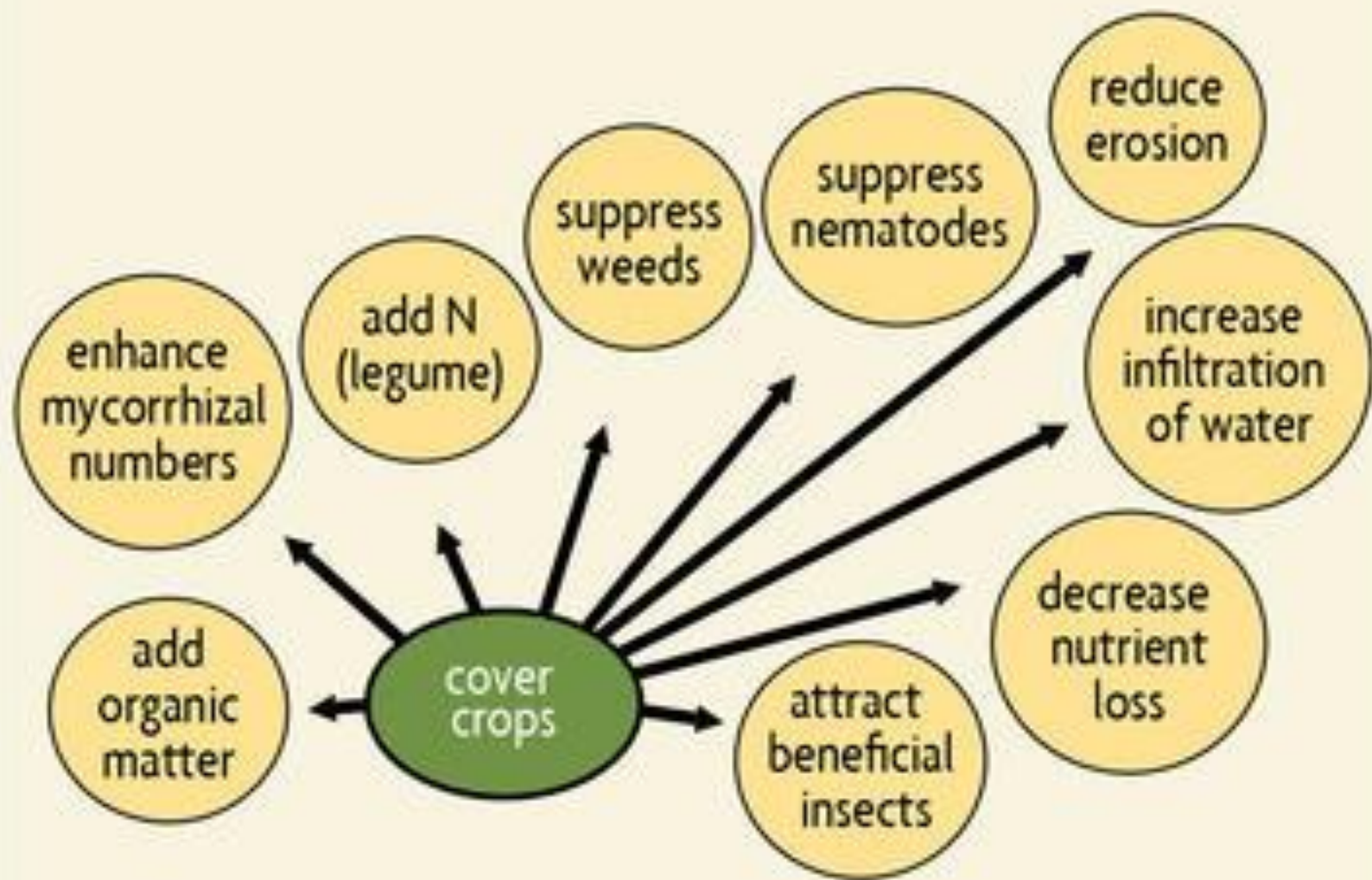


Figure 10.1. Cover crops have multiple benefits.



The International Food Policy Research Institute Says...*(in a 2014 report)*

- No-till farming alone could increase maize yields by 20 percent, but also irrigating the same no-till fields could increase maize yields by 67 percent in 2050.
- Nitrogen-use efficiency could increase rice crop yields by 22 percent, but irrigation increased the yields by another 21 percent.
- Heat-tolerant varieties of wheat could increase crop yields from a 17 percent increase to a 23 percent increase with irrigation.

NUTRIENT POLLUTION

IMPACTS ON THE NATION

Nutrient Pollution is one of America's most serious water pollution issues today. Limiting nutrient pollution will protect people's health, support the economy, and keep America's waters safe for swimming and fishing.

Nutrient pollution occurs when there is an excess of nitrogen and phosphorus



50 out of 50
states are impacted by
nutrient pollution

States have identified about **15,000** water bodies in the US with nutrient-related problems

Reported drinking water violations for nitrates have nearly doubled in the last decade

Nutrient pollution is widespread



DID YOU KNOW?
The Mississippi River Basin spans 31 states and ultimately drains into the Gulf of Mexico

Nutrient pollution from the Mississippi River Basin is causing a large "dead zone" in the Gulf of Mexico that cannot support aquatic life



Where does nutrient pollution come from?

Fossil Fuels

250 million cars and trucks in the US release more than 7 million tons of nitrogen oxides into the atmosphere, contributing to pollution in air and water



Agriculture

Animal manure, excess fertilizer applied to crops and fields, and soil erosion make agriculture a large source of nutrient pollution

Livestock production generates close to **1 BILLION TONS** of manure



From 1964 to 2008, agricultural fertilizer use increased by **25%**

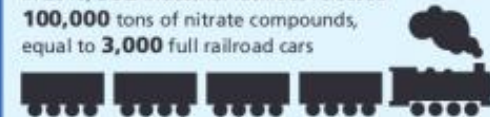
Urban Sources

About 10% of the nutrients flowing from the Gulf of Mexico come from urban stormwater and wastewater/sewage treatment plants



Industry

In 2010, **592** industrial facilities released **100,000** tons of nitrate compounds, equal to **3,000** full railroad cars



The Indiana Conservation [Partnership](#) is comprised of eight Indiana agencies and organizations who share a common goal of promoting conservation. To that end, the mission of the Indiana Conservation Partnership is to provide technical, financial and educational assistance needed to implement economically and environmentally compatible land and water stewardship decisions, practices and technologies.



INDIANA ASSOCIATION OF
soil and water conservation
DISTRICTS



PURDUE
EXTENSION



CONSERVATION CROPPING SYSTEMS

INITIATIVE-CCSI



- Established [mentoring program](#)
- Over 250 field days/workshops/events reaching over 15,000 people
- Over 250 producers have been assisted with one-on-one support
- 16 mentors evaluated and trained; worked with 30 producers in first year
- 5 workshops for agency staff reaching over 190 employees
- 8 private providers attending high level trainings; 52 industry staff from one event
- Promoting top farmers via website, videos, etc.
- Assisting with [INfield Advantage](#) program
- In 2012, Indiana led the nation on acres of cover crops planted. The [Natural Resources Conservation Service](#) estimates that close to 1 million acres of Indiana's 12 million acres of cropland had one or more cover crops on them.



Natural Resources Conservation Service

