

# CREATING EDIBLE LANDSCAPES & FOREST GARDENS WITH NATIVE PLANTS

**a strategy for community food security &  
carbon sequestration**

Jersey-Friendly Yards Conference  
October 19, 2019



**Jersey-Friendly Yards** is your one-stop source of information for sustainable landscaping in New Jersey.

*This website offers New Jersey-specific resources and tools to help you landscape for a healthy environment and a healthy economy.*

**Visit Jersey-Friendly Yards to get started today!**

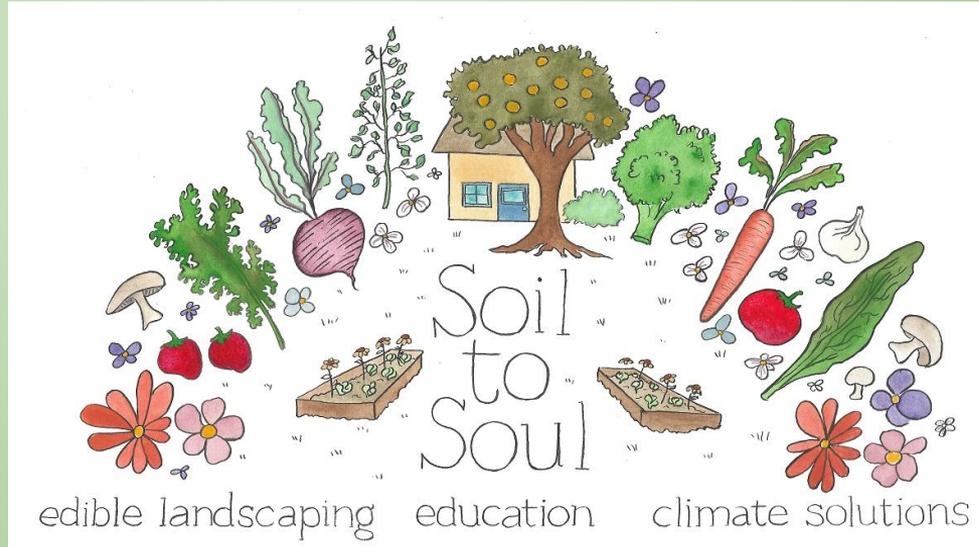
[www.jerseyyards.org](http://www.jerseyyards.org)

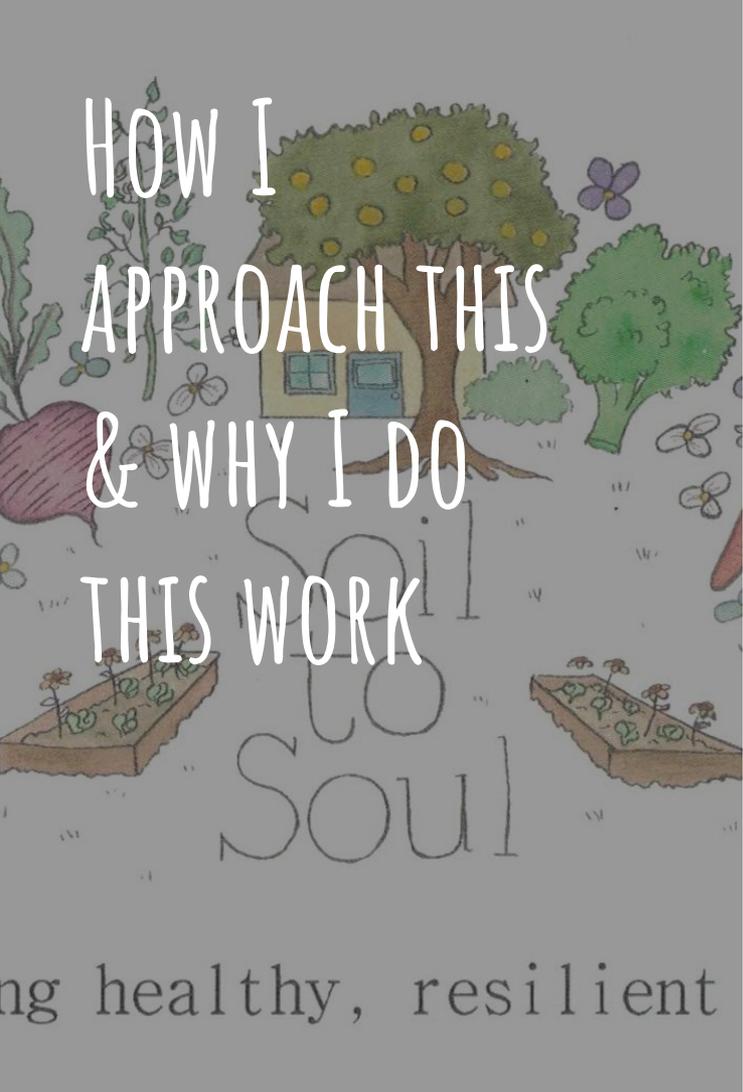
FOREST GARDEN EST. 2018. TUCKERTON NJ.  
MARKET GARDEN. REGENERATIVE AGRICULTURE.  
3/4 ACRE RESIDENTIAL SITE.

66

I like to call it edible restoration, since the tools used in permaculture can help to restore land as well as yield food for humans.

AMY STROSS, THE SUBURBAN MICRO-FARM





HOW I  
APPROACH THIS  
& WHY I DO  
THIS WORK

ng healthy, resilient

*What I am...*

A food access, food justice and climate justice advocate/activist, a sustainability practitioner, an educator, a regenerative agriculture farmer.

*What I am not...*

An expert! A biologist, horticulturist, a soil scientist, a climate scientist, a certified permaculture practitioner.

**Bayside Park Community Farm,  
Bayside CA**



**Open Door Community Health  
Centers, Humboldt County, CA**

**Rx for Wellness, Community  
Gardens Program**



Open Door's Rx for Wellness, Community  
Food Access, Community Gardens Program





+NO-TILL  
+PERMACULTURE  
+RESTORATION/REGENERATIVE  
AG



# INTENTIONS FOR THIS TALK...

- Get you excited about the myriad benefits of forest gardens and perennial polyculture!
- Share information about incorporating native (and non)edible & medicinal plants into your growing spaces -- inspire you to give it a try!
- Share information about how you can sequester carbon at the home & community scale with regenerative agriculture techniques!

A lush green food forest with various plants and trees. The background is filled with dense foliage, including tall trees and lower-growing plants. The text is overlaid on the image in white boxes with black outlines.

WHAT IS A FOOD FOREST (FOREST GARDEN)?

\*GROWING FOOD BY MODELING NATURE

\*AN ANCIENT, INDIGENOUS HORTICULTURAL PRACTICE,  
REIMAGINED FOR THE 21ST CENTURY.

\*USEFUL AT MANY SCALES AND ENVIRONMENTS.



A photograph of a lush, green forest garden. The garden is filled with various types of trees and plants, including a large, dense green tree on the left and several smaller, younger trees in the center and right. The ground is covered with brown mulch and some green plants. In the background, there is a brick building on the left and a street with a traffic light and a car on the right. The text "FOREST GARDENING CENTERS AROUND INTENTIONALLY-DESIGNED PERENNIAL POLY-CULTURE." is overlaid on the left side of the image.

FOREST GARDENING CENTERS AROUND  
INTENTIONALLY-DESIGNED  
PERENNIAL POLY-CULTURE.

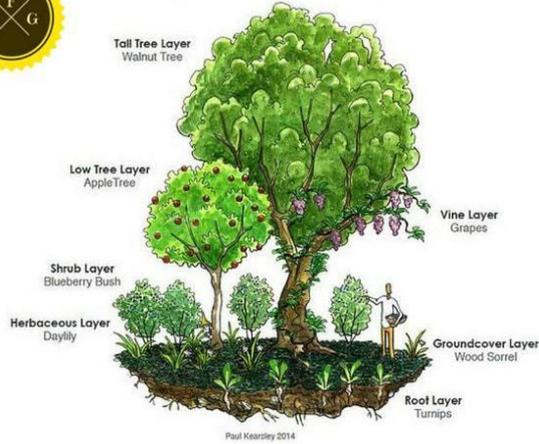


THE CULTIVATION OF DIVERSE, PERENNIAL  
PLANT COMMUNITIES.

CULTIVATING PERENNIAL PLANTS IN  
FUNCTIONAL, MUTUALLY-BENEFICIAL GROUPS,  
OR GUILDS.



## Layers of a Forest Garden



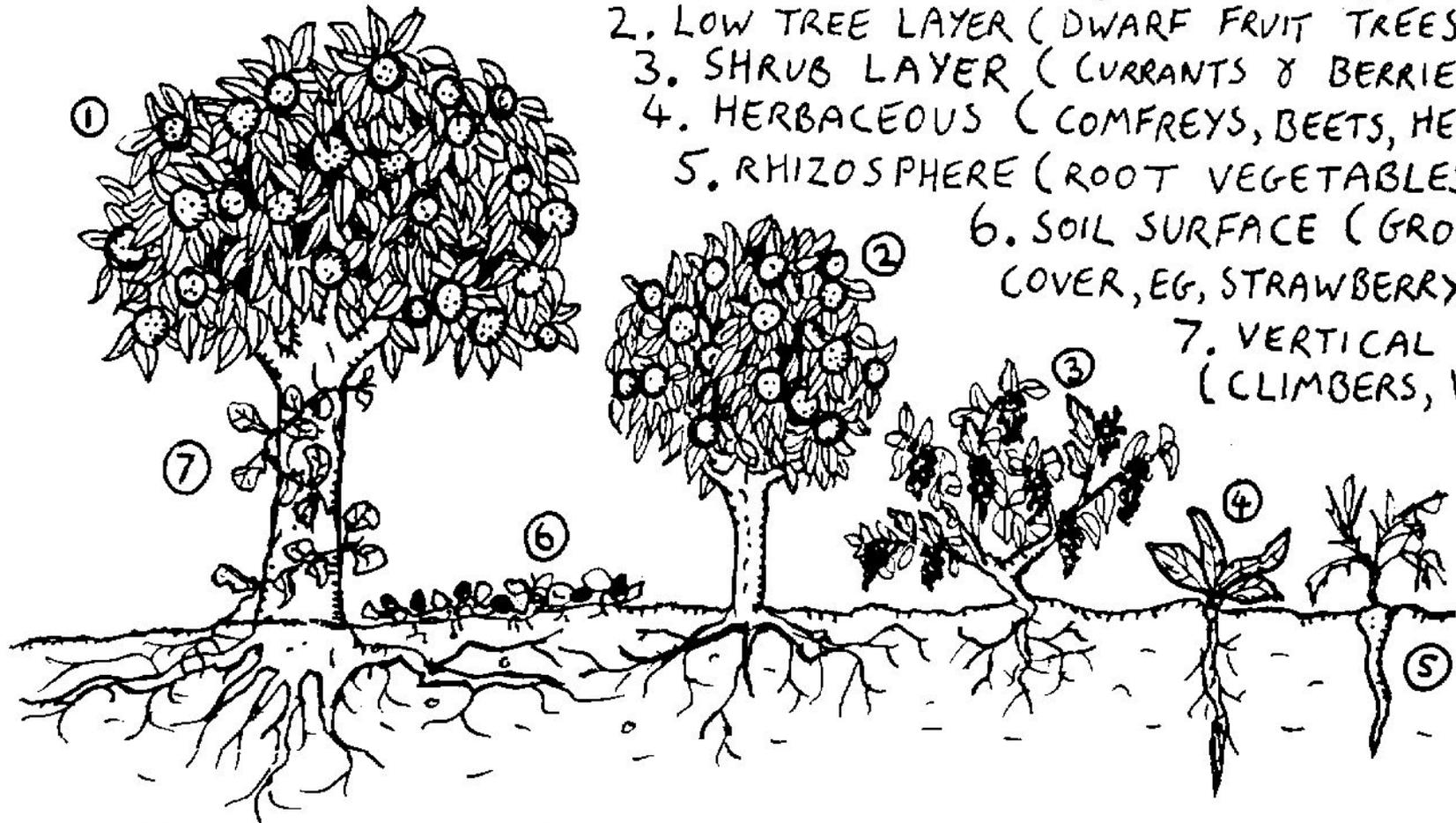
grow a food forest

& create plant guilds

**GUILDS:** a grouping of companion plants that support a central element for maximum harvest, maximum efficiency of resources, and use of space.



1. CANOPY (LARGE FRUIT & NUT TREES)
2. LOW TREE LAYER (DWARF FRUIT TREES)
3. SHRUB LAYER (CURRANTS & BERRIES)
4. HERBACEOUS (COMFREYS, BEETS, HERBS)
5. RHIZOSPHERE (ROOT VEGETABLES)
6. SOIL SURFACE (GROUND COVER, EG, STRAWBERRY, ETC)
7. VERTICAL LAYER (CLIMBERS, VINES)



THE FOREST GARDEN: A SEVEN LEVEL BENEFICIAL GUILD

# 9 LAYERS IN A FOREST GARDEN

## SMALL TREES

10-30' HEIGHT

Plum, Apple, Apricot, Pear, Quince, Pawpaw, Hawthorn, Medlar, Chinquapin Chestnut, Jujube, Some Juneberrries, Mountain Ash, Asian Persimmon, etc.

## SHRUBS

4-15' HEIGHT

Currants, Most Hazelnuts, Viburnums, Seaberry, Aronia, Gooseberry, Rose, Elderberry, Some Juneberrries, Eleagnus, Bush Cherries, Quince, etc.

## FORBS/HERBS

1-6' HEIGHT

Asparagus, Perennial Greens, Brambles, Nettles, Mints, Indigos, Most Grasses, Daylilies, Rhubarb, etc.

## GROUNDCOVERS

1' OR LESS HEIGHT

Strawberries, Violets, Clover, Mints, Thymes, etc.

## ROOTS/TUBERS

BELOW SOIL SURFACE

Sunchokes, Groundnuts, Potatoes, Scorzoneria, Licorice, Horseradish, Salsify, etc.

## FUNGI

UNDERGROUND, OR ON MUSHROOM LOGS IN SHADE

## VINES

CLIMBING PLANTS

Groundnuts, Hops, Grapes, Hardy Kiwi, Mountain Yam, Schisandra, Squash, Maypop, Melons, Pole Beans, etc.

## MEDIUM-TALL TREES

30-50' HEIGHT

Euro/Asian Chestnut, English Walnut, Wild Pear, Sassafrass, Heartnut

## CANOPY/TALL TREES

50-100+ FT. HEIGHT

Most Oaks, Hickory, Pecan, Black Walnut, American Persimmon, American Chestnut, Hackberry, Most Locusts, etc.

Small yards may not have the room for some of these larger species, or you could prune for height control. Taller species should be placed toward the North, shorter to South, for optimal partitioning of sunlight.

## NITROGEN-FIXERS

CAN GROW IN ANY LAYER—IMPORTANT TO OVERALL SYSTEM

Locust Trees, Kentucky Coffeetree, Alders, Autumnberry, Seaberry, Buffaloberry, Indigo, Leadplant, Licorice, Clovers, Peas, Beans, Groundnut, Acacia, etc.

HEIGHT

100'

50'

20'

12'

6'

NORTH

SUN-LOVING/SHORTER SPECIES TO SOUTH

SHADE-TOLERANT SPECIES BELOW

SMALL TREES

UNDER-STORY TREES

GROUNDCOVER

FORBS

SHRUB

FORBS

SHRUB

VINES

GROUNDCOVER

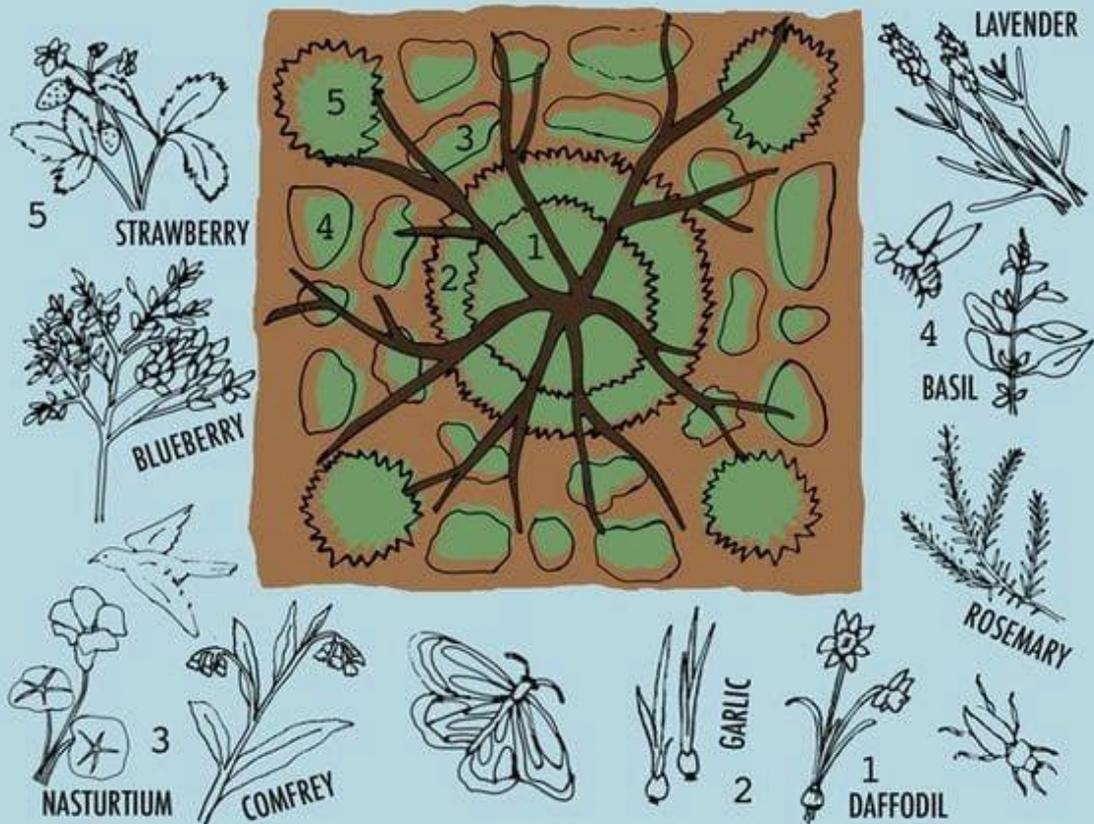
ROOTS

TUBERS

FUNGI

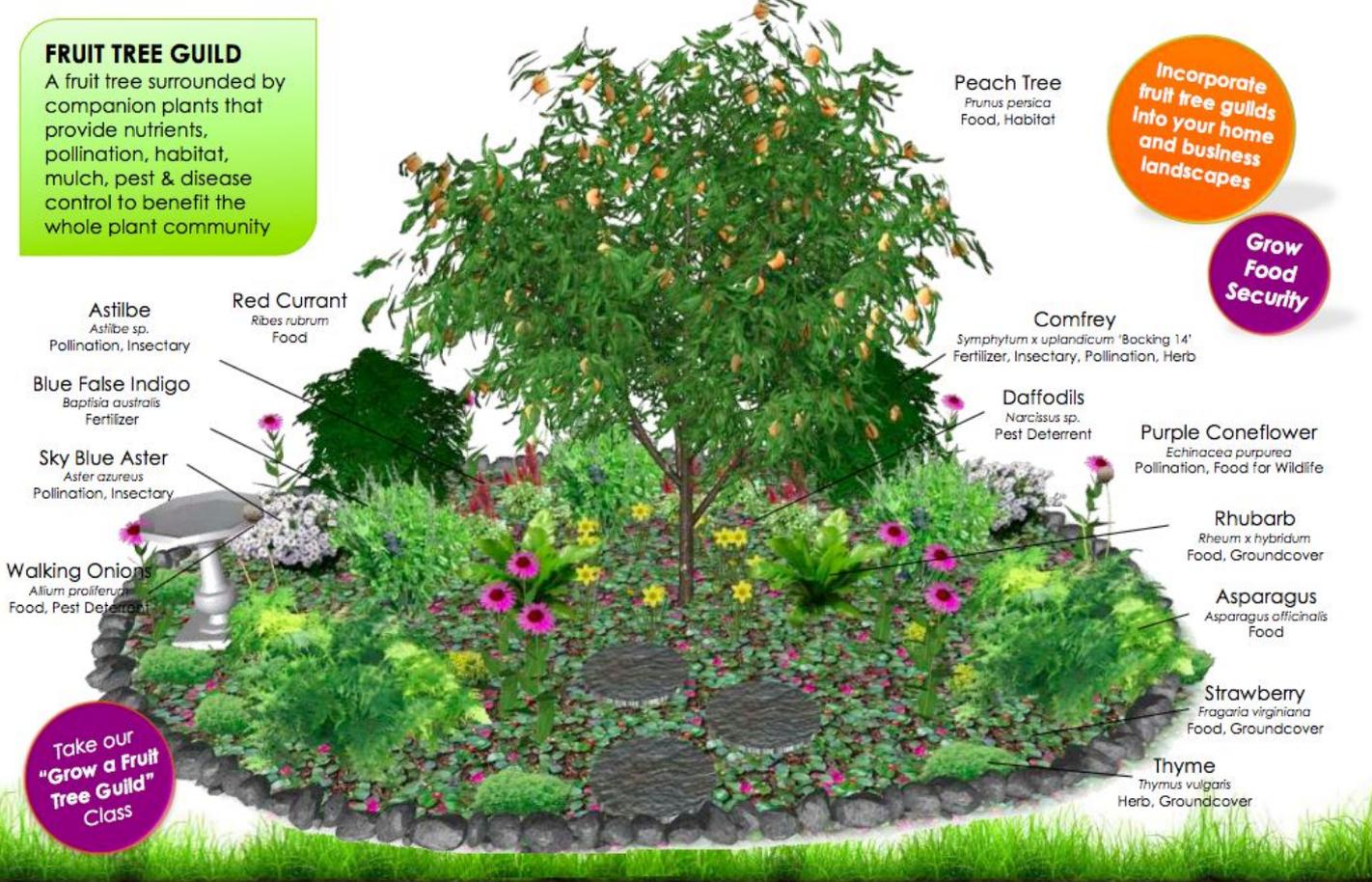
# FRUIT TREE GUILD

AT BASE OF THE FRUIT TREES - SPRING FLOWERING BULBS & GARLIC TO REPEL GARDEN PESTS.  
NEXT A RING OF PLANTS WHICH COMPOST THE SOIL SUCH AS NASTURTIUMS AND COMFREY.  
THEN HERBS AND LAVENDER TO ATTRACT INSECTS TO POLLINATE THE FRUIT.  
SOFT FRUITS LIKE BLUEBERRIES AND STRAWBERRIES ADD HUMAN AND BIRD FORAGING.



## FRUIT TREE GUILD

A fruit tree surrounded by companion plants that provide nutrients, pollination, habitat, mulch, pest & disease control to benefit the whole plant community



Peach Tree  
*Prunus persica*  
Food, Habitat

Incorporate  
fruit tree guilds  
into your home  
and business  
landscapes

Grow  
Food  
Security

Astilbe  
*Astilbe* sp.  
Pollination, Insectary

Red Currant  
*Ribes rubrum*  
Food

Comfrey  
*Symphytum x uplandicum* 'Bocking 14'  
Fertilizer, Insectary, Pollination, Herb

Blue False Indigo  
*Baptista australis*  
Fertilizer

Daffodils  
*Narcissus* sp.  
Pest Deterrent

Purple Coneflower  
*Echinacea purpurea*  
Pollination, Food for Wildlife

Sky Blue Aster  
*Asfer azureus*  
Pollination, Insectary

Rhubarb  
*Rheum x hybridum*  
Food, Groundcover

Walking Onions  
*Allium proliferrum*  
Food, Pest Deterrent

Asparagus  
*Asparagus officinalis*  
Food

Strawberry  
*Fragaria virginiana*  
Food, Groundcover

Thyme  
*Thymus vulgaris*  
Herb, Groundcover

Take our  
"Grow a Fruit  
Tree Guild"  
Class

## SOIL

Well-draining, fertile  
Sandy, loamy texture  
pH 6.0 – 8.0

## WATER

1-2" rain/water/week  
Avoid overwatering  
Avoid areas of flooding

## SUN

6+ hours full sun daily  
Eastern & Southern  
exposures are best

## NUTRIENTS

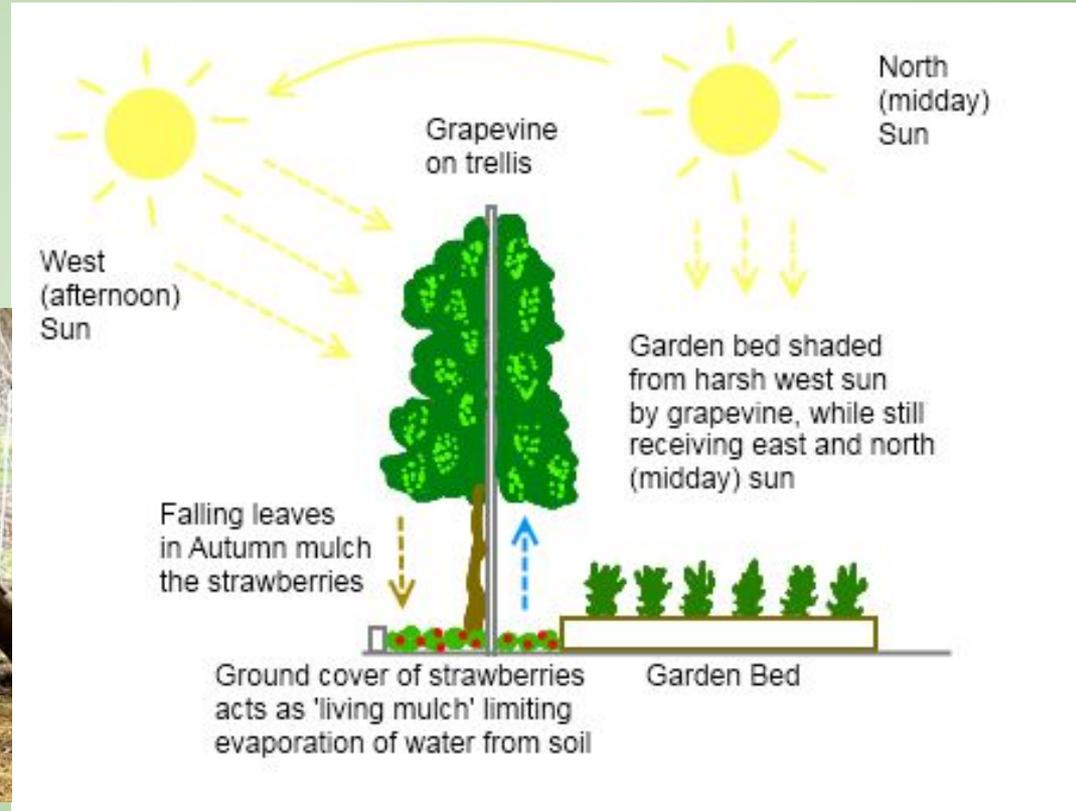
Top dress with compost,  
leaf mulch, and natural  
hardwood chips



STACKING  
FUNCTIONS:  
EACH ELEMENT  
OF THE DESIGN &  
EACH PLANT SHOULD  
HAVE A MINIMUM OF  
TWO SEPARATE  
FUNCTIONS.  
CREATING  
SELF-SUSTAINING,  
EFFICIENT, RESILIENT  
SYSTEMS.

# PERMACULTURE PRINCIPLE: STACKING FUNCTIONS:

EACH ELEMENT OF THE DESIGN & EACH PLANT SHOULD HAVE A MINIMUM OF TWO SEPARATE FUNCTIONS.



# STACKING FUNCTIONS TO CONSIDER:

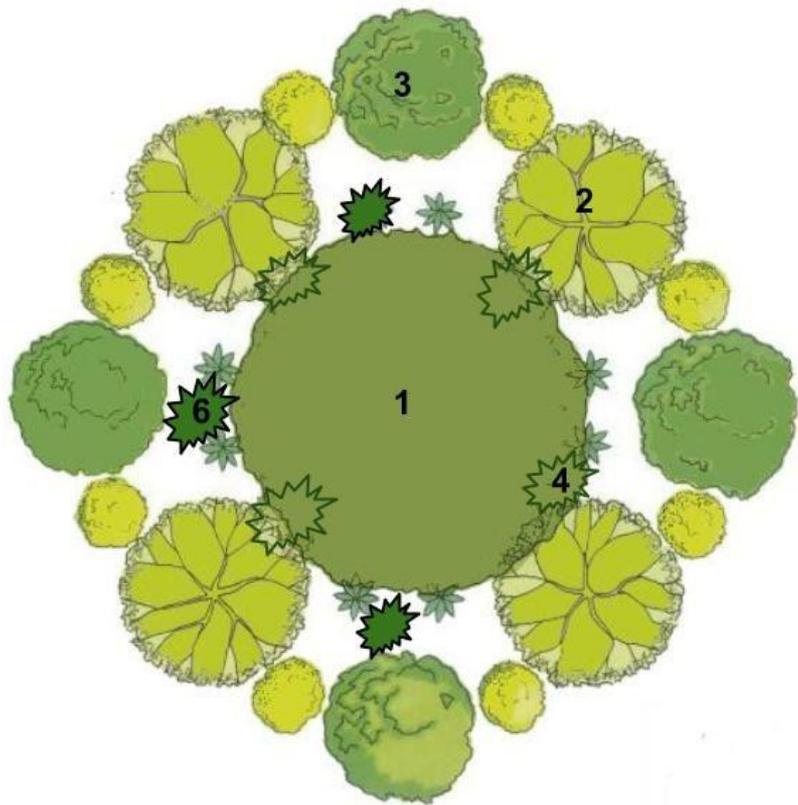
## Ecological benefits

- Build soil
  - +fix nitrogen
  - +draw up nutrients
  - +create mulch
  - +habitat for microorganisms
  - +add organic matter
- +Shade
- +wind block
- +deer protection
- +carbon sequestration

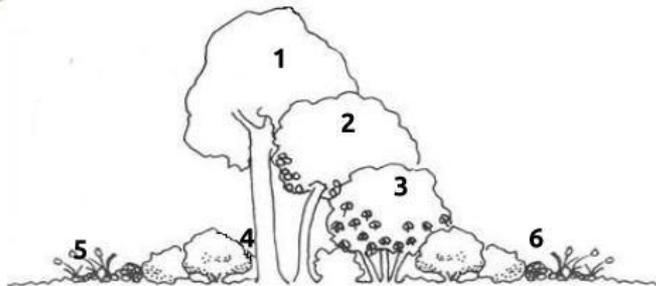
## Human benefits

- +edible or medicinal uses
- +market value; cash crop/barter





1. **Canopy**
  - 1.1. Oak
2. **Sub Canopy**
  - 2.1. Cherry
  - 2.2. Mulberry
3. **Shrub**
  - 3.1. Hazelnut
  - 3.2. Elderberry
  - 3.3. Gooseberry
4. **Herbaceous**
  - 4.1. Fennel
  - 4.2. Comfrey
  - 4.3. Basil
  - 4.4. Bee Balm
  - 4.5. Iris
5. **Ground Cover**
  - 5.1. Mint
  - 5.2. Strawberries
  - 5.3. Violets
6. **Underground**
  - 6.1. Horseradish
  - 6.2. Wild Ginger



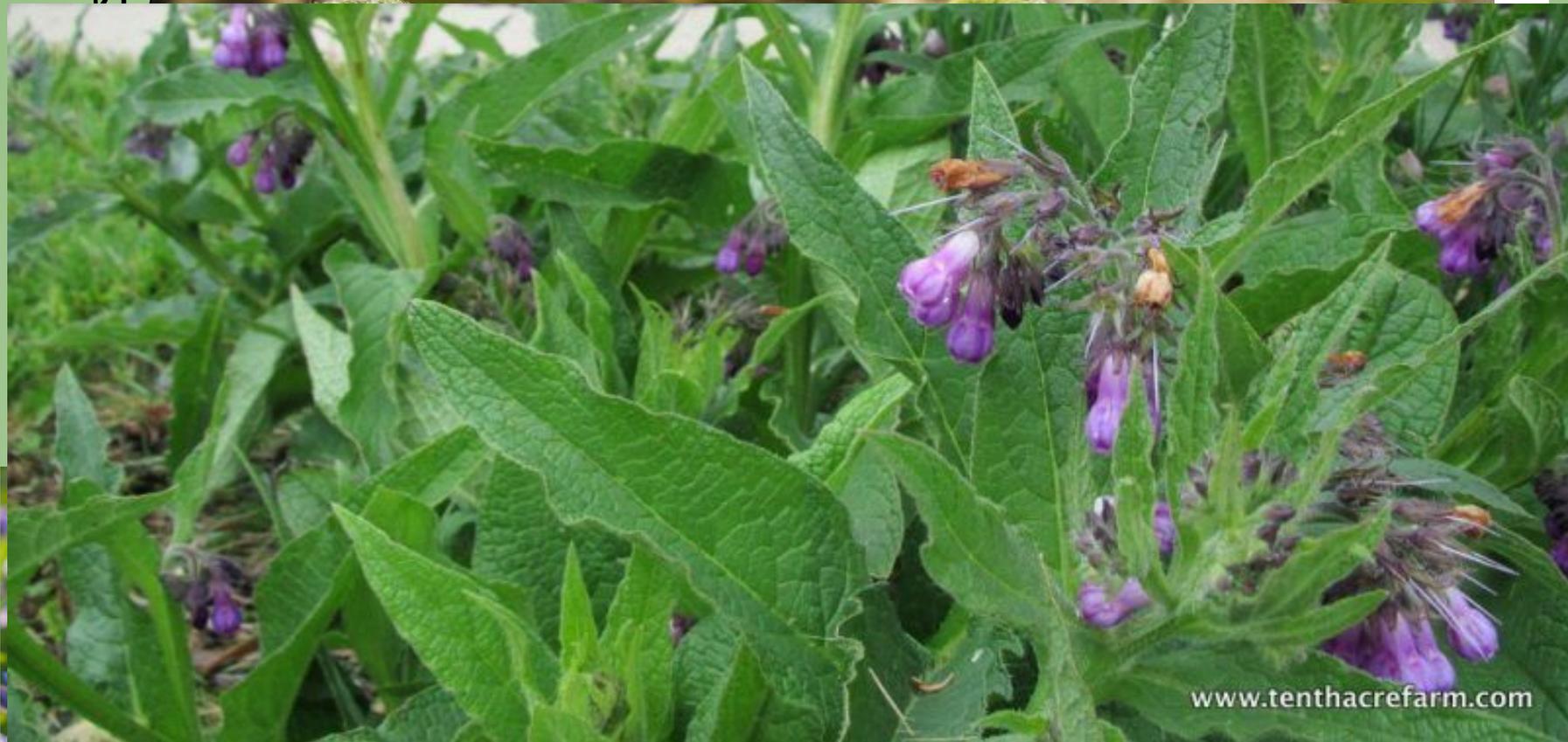
# INTEGRATING GUILDS INTO EXISTING LANDSCAPE SPACES

# PERMACULTURE (& FOREST GARDENING) PRINCIPLES:

- + OBSERVATION / KNOWLEDGE OF YOUR SPACE
- + WORKING WITH NATURE, NOT IMPOSING YOUR WILL
- + MINIMIZING INPUTS (DESIGNING SELF-SUSTAINING / LOW-MAINTENANCE, RESILIENT SYSTEMS)
- + UTILIZING WHAT YOU HAVE AVAILABLE

Plants with fuzzy or hairy foliage, like this variegated Siberian bugloss, are a s  
plagued by deer.

D1



(Buxus), **Salvias**, tansy (Tanacetum), bee balm (Monarda), mountain mint (Pycnanthemum), dead nettle (Lamium), blue mist shrub (Caryopteris), **dill**, lantana, and calamint (Calamintha).



# USING INDIGENOUS & NATIVE EDIBLES AND MEDICINALS TO CREATE GUILDS

Canopy trees:  
Oak, "american"  
chestnut,  
walnut, pine,  
persimmon

Black walnut guild



# USING INDIGENOUS & NATIVE EDIBLES AND MEDICINALS TO CREATE GUILDS

Canopy trees: oak,  
chestnut, walnut,

- Bee Balm (*Monarda* sp.)
- Yarrow (*Achillea millefolium*)
- Calendula (*Calendula officinalis*)
- Violet (*Viola* sp.)
- Black Raspberry (*Rubus occidentalis*)
- Grapes (*Vitus* sp.)

Shrubs that grow near black walnut trees

- Elder (*Sambuca* sp.)
- Cherry (*Prunus* sp.)
- Rose (*Rosa* sp.)
- Pears (*Pyrus* sp.)
- Plum (*Prunus* sp.)
- Apricots (*Prunus*, sp)
- Currants (*Ribes* spp.)
- Hazelnut (*Corylus Americana*)

BRINGING BACK  
AMERICAN  
CHESTNUT -- HEAVY  
HITTER CARBON  
SEQUESTRATION!

(WIPED OUT BY BLIGHT/FUNGUS IN EARLY 1900S)



ENVIRONMENT

# Researchers can restore the American chestnut through genetic engineering. But at what cost?

Andrei Stanescu / iStock

The GM chestnut, a research project funded by Monsanto and other large agribusinesses, could infringe on indigenous sovereignty

# USING INDIGENOUS & NATIVE EDIBLES AND MEDICINALS FOR GUILDS — CORYLUS AMERICANA



For sub-canopy or shrub layer



# PERSIMMON, PAW PAW, ELDERBERRY, CRABAPPLE



SHRUB LAYER: BEACH PLUM, CHOKEBERRY, Highbush  
BLUEBERRY, BLACK RASPBERRY, BLACKBERRY, HUCKLEBERRY, FIG,  
CURRENTS (WHITE)



Birds love white currant!



*Rubus occidentalis* --INDIGENOUS FOODS!



THE HERBACEOUS, GROUND COVER AND ROOT ZONE LAYERS --  
MY FAVORITES!

**Important  
guild-players:**

**Nitrogen-Fixers!**

**Native pollinator-  
attractors!**

**Dear protection!**





**Indigenous squashes!**

PERENNIAL EDIBLE NATIVE VINING LEGUME: HOG PEANUT,  
*AMPHICARPAEA BRACTEATA*



FO  
STR

## Agriculture, Forestry and Other Land Use (AFOLU)



24%

### DISTRIBUTION OF GLOBAL GREENHOUSE GAS (GHG) EMISSIONS BY SECTOR

Industry



21%

Transport



14%

Energy



35%

Buildings



6%

Source: I

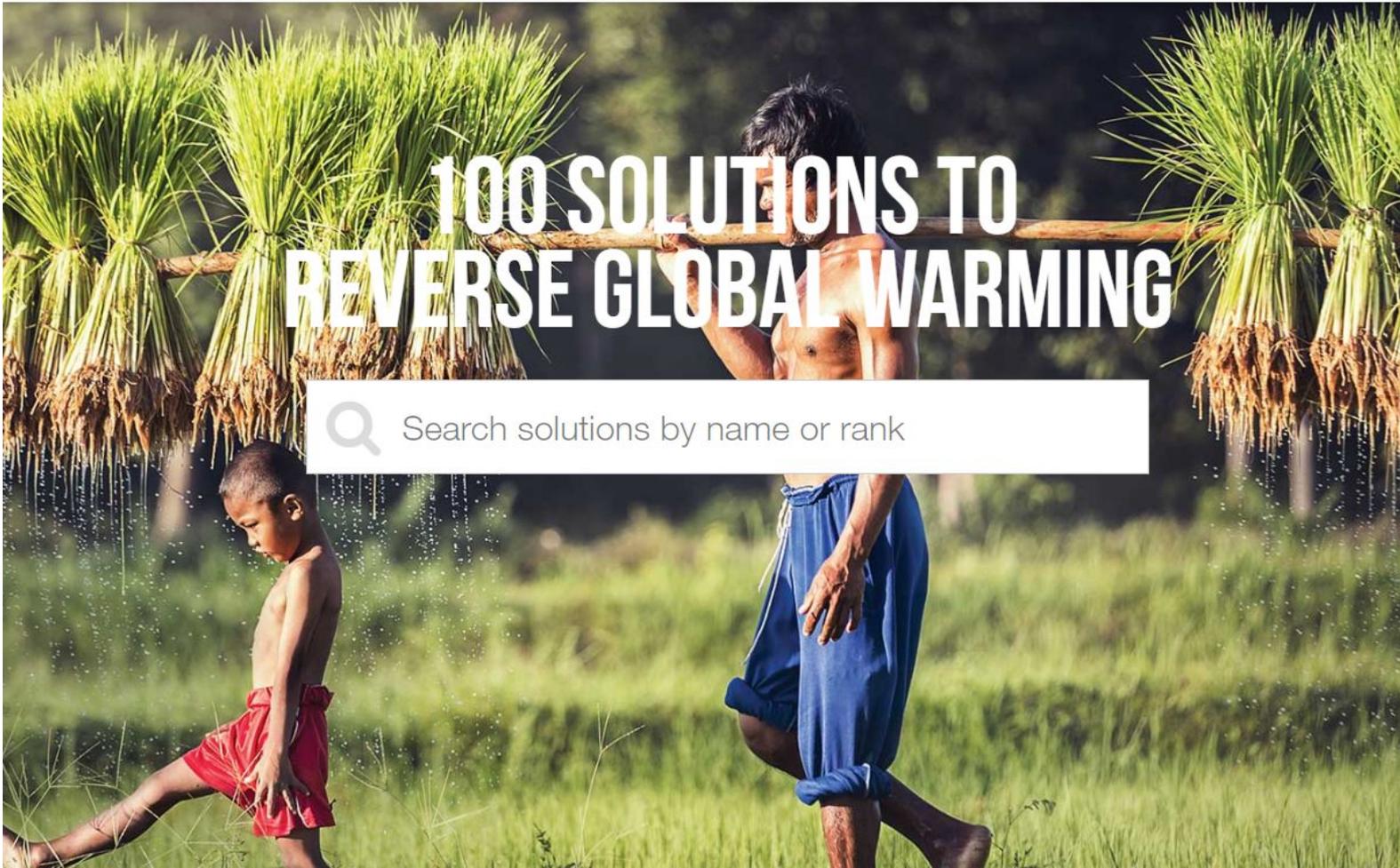
Source: University of California Carbon Neutrality Initiative



# CARBON SEQUESTRATION

Carbon sequestration is the process by which atmospheric carbon dioxide is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils.

(U.S. Department of Agriculture Forest Service)



# 100 SOLUTIONS TO REVERSE GLOBAL WARMING



Search solutions by name or rank

ANALYSIS OF THE VARIOUS MITIGATION SOLUTIONS TO CLIMATE CHANGE, RANKED BY HOW MUCH GHGS THEY REDUCE/REPLACE.

FOOD AND AG SOLUTIONS ARE AT THE TOP OF THE LIST!

Rank	Solution	Sector	TOTAL ATMOSPHERIC CO <sub>2</sub> -EQ REDUCTION (GT)	NET COST (BILLIONS US \$)	SAVINGS (BILLIONS US \$)
1	<a href="#">Refrigerant Management</a>	Materials	89.74	N/A	\$-902.7
2	<a href="#">Wind Turbines (Onshore)</a>	Electricity Generation	84.60	\$1,225.37	\$7,425.0
3	<a href="#">Reduced Food Waste</a>	Food	70.53	N/A	N/A
4	<a href="#">Plant-Rich Diet</a>	Food	66.11	N/A	N/A
5	<a href="#">Tropical Forests</a>	Land Use	61.23	N/A	N/A
6	<a href="#">Educating Girls</a>	Women and Girls	51.48	N/A	N/A
7	<a href="#">Family Planning</a>	Women and Girls	51.48	N/A	N/A
8	<a href="#">Solar Farms</a>	Electricity Generation	36.90	\$-80.60	\$5,023.8
9	<a href="#">Silvopasture</a>	Food	31.19	\$41.59	\$699.3
10	<a href="#">Rooftop Solar</a>	Electricity Generation	24.60	\$453.14	\$3,457.6
11	<a href="#">Regenerative Agriculture</a>	Food	23.15	\$57.22	\$1,928.1
12	<a href="#">Temperate Forests</a>	Land Use	22.61	N/A	N/A
13	<a href="#">Peatlands</a>	Land Use	21.57	N/A	N/A
14	<a href="#">Tropical Staple Trees</a>	Food	20.19	\$120.07	\$626.9
15	<a href="#">Afforestation</a>	Land Use	18.06	\$29.44	\$392.3
16	<a href="#">Conservation Agriculture</a>	Food	17.35	\$37.53	\$2,119.0
17	<a href="#">Tree Intercropping</a>	Food	17.20	\$146.99	\$22.1
18	<a href="#">Geothermal</a>	Electricity Generation	16.60	\$-155.48	\$1,024.3



# FOOD REGENERATIVE AGRICULTURE

#11

## RANK AND RESULTS BY 2050

23.15 GIGATONS  
REDUCED CO<sub>2</sub>

\$57.22 BILLION  
NET IMPLEMENTATION COST

\$1.93 TRILLION  
NET OPERATIONAL SAVINGS

The Rodale Institute farm in Kutztown, PA: 333 acres of formerly degraded farmland restored to productivity and biosequestration through regenerative agriculture.

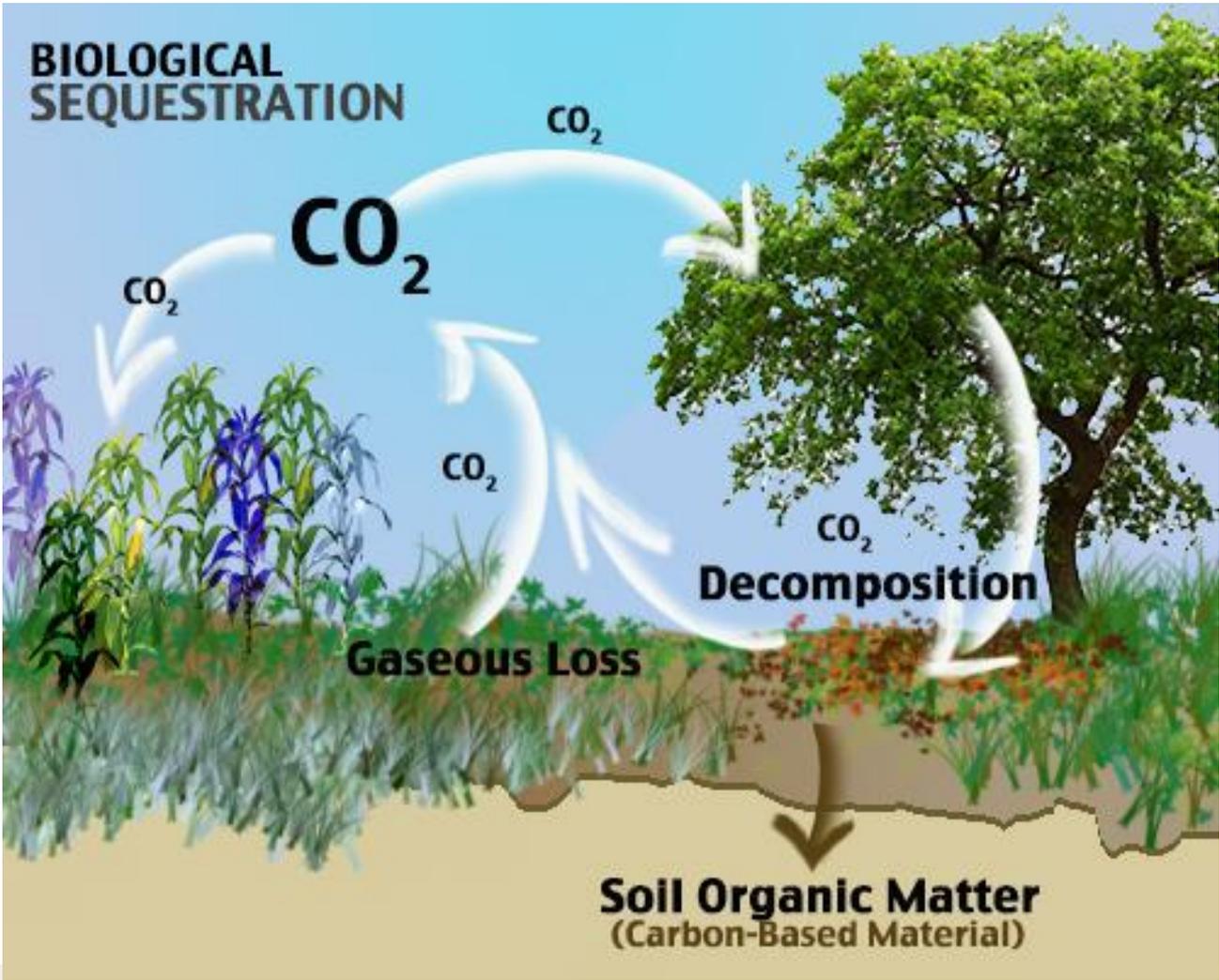
Conventional wisdom has long held that the world cannot be fed without chemicals and synthetic fertilizers. Evidence points to a new wisdom: The world cannot be fed unless the soil is fed. Regenerative agriculture enhances and sustains the health of the soil by restoring its carbon content, which in turn improves productivity—just the opposite of conventional agriculture.

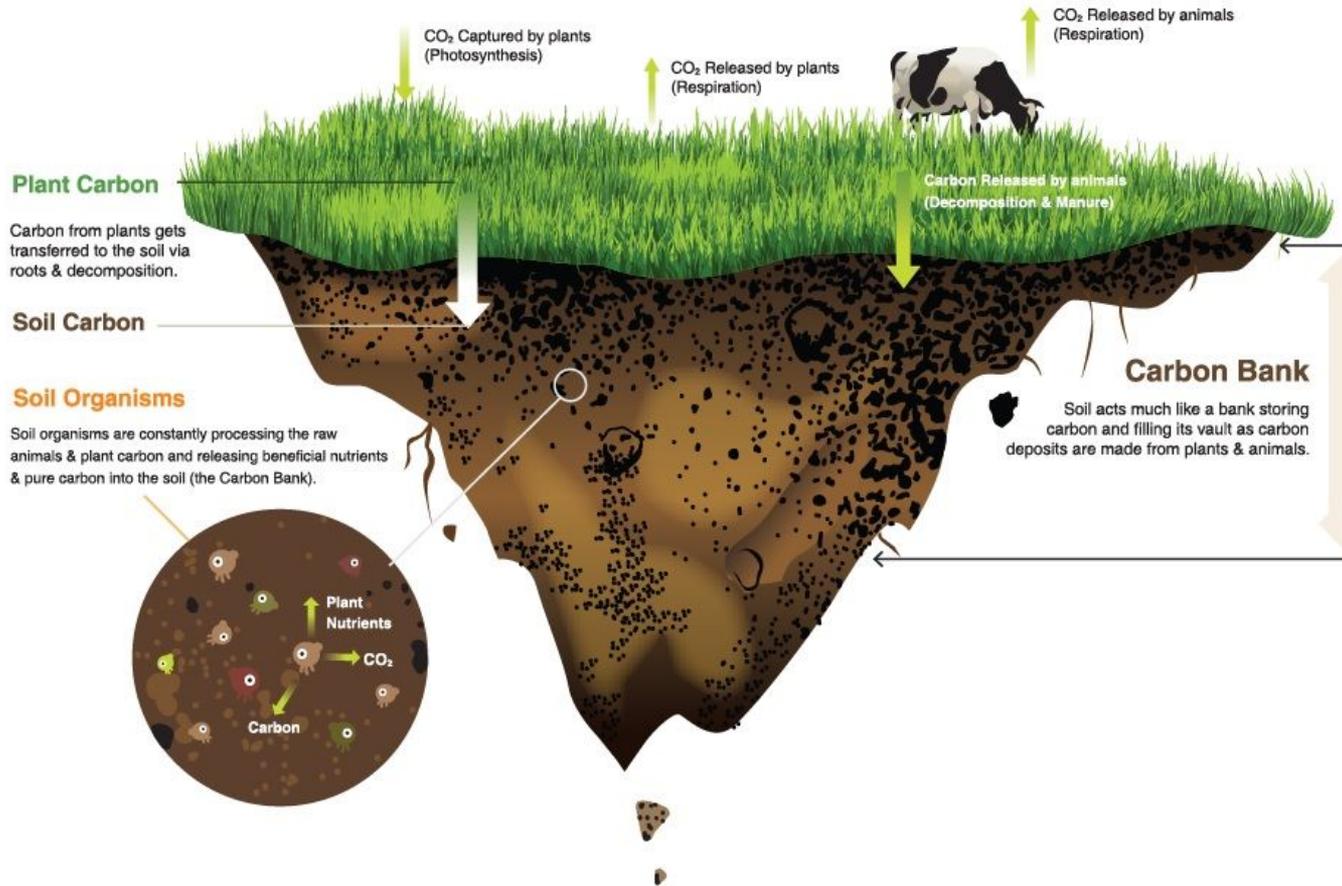
Regenerative agricultural practices include:

- no tillage,
- diverse cover crops,
- in-farm fertility (no external nutrients),
- no pesticides or synthetic fertilizers, and
- multiple crop rotations.

Together, these practices increase carbon-rich soil organic matter. The result: vital microbes proliferate, roots go deeper, nutrient uptake improves, water retention increases, plants are more pest resistant, and soil fertility compounds. Farms are seeing soil carbon levels rise from a baseline of 1 to 2 percent up to 5 to 8 percent over ten or more years, which can add up to 25 to 60 tons of carbon per acre.

*IMPACT: From an estimated 108 million acres of current adoption, we estimate regenerative agriculture to increase to a total of 1 billion acres by 2050. This rapid adoption is based in part on the historic growth rate of organic agriculture, as well as the projected conversion of conservation agriculture to regenerative agriculture over time. This increase could result in a total reduction of 23.2 gigatons of carbon dioxide, from both sequestration and reduced emissions. Regenerative agriculture could provide a \$1.9 trillion financial return by 2050 on an investment of \$57 billion.*



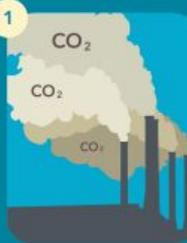


Managing carbon is key to soil health.

(From <http://australiansoil.com.au/soil-management-bebefits/>)

## WHY SOIL

1



4



7



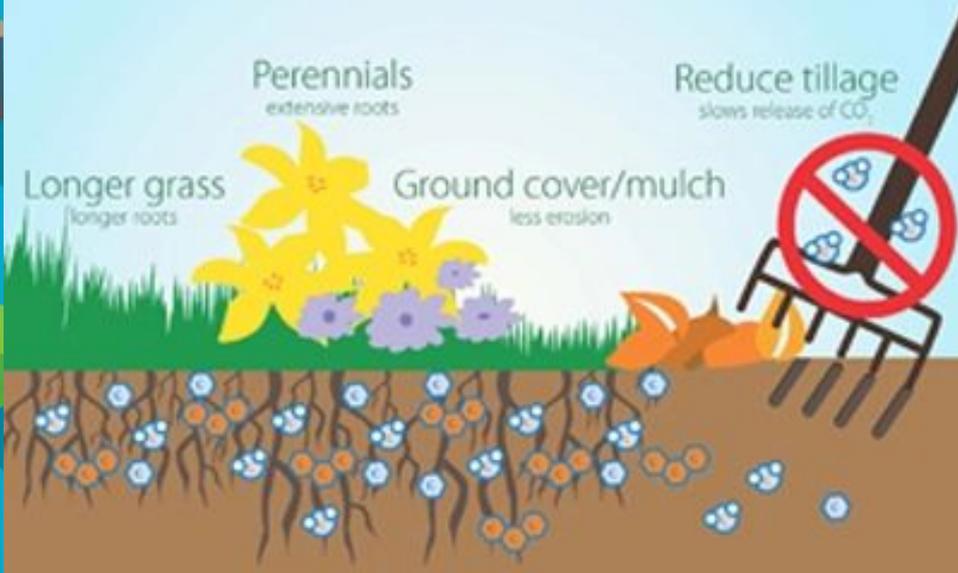
# Keep carbon in your soil

Perennials  
extensive roots

Reduce tillage  
slows release of CO<sub>2</sub>

Longer grass  
longer roots

Ground cover/mulch  
less erosion



**IFOAM**  
ORGANICS  
INTERNATIONAL

Soil is our secret weapon in the battle against climate change. It absorbs huge amounts of carbon from all around us.

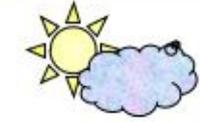
Other methods, such as longer grazing periods in pasture management, agroforestry, hedges at field boundaries and restoration of land in poor condition can further increase soil organic carbon levels.

*Healthy soils  
= healthy food  
= healthy people  
= healthy planet.*

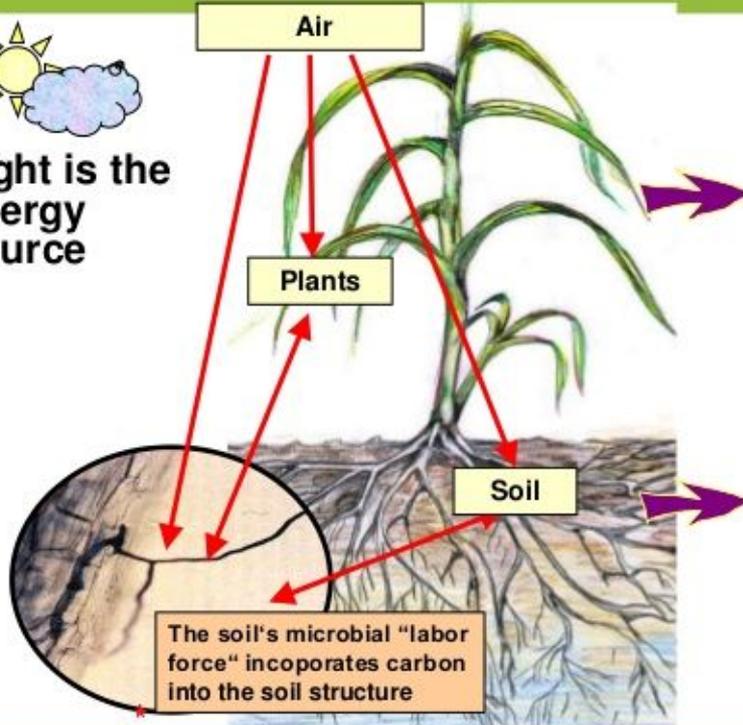
**Soil**  
Science  
Society of America



## Proven Carbon Sequestration



Light is the energy source



Human nutrition and health starts in the soil, from which plants draw their nutrients

The soil microbial community provides the nutritional building blocks that plants need to grow and thrive

The soil's microbial "labor force" incorporates carbon into the soil structure

The plant is taking in carbon dioxide from the atmosphere, yes, but also the carbon coming back up through the soil.

The plant then recycles it back into the soil.

A lush garden path with trees and flowers. The path is a narrow, well-tended strip of green grass that leads from the foreground into the distance, flanked by dense foliage. On either side, there are various plants, including tall purple flowers and white bell-shaped flowers. The trees are thick with vibrant green leaves, creating a canopy that filters the sunlight. The overall scene is peaceful and verdant.

IT MEANS WE HAVE TO THINK OF  
OURSELVES AS "CARBON FARMERS"



CARBON FARMING &  
REGENERATIVE AGRICULTURE:  
A MOVEMENT TO PRODUCE FOOD  
IN A MANNER THAT CAN  
MITIGATE & HELP REVERSE  
GLOBAL WARMING.

# HOW DO FOOD FORESTS OR FOREST GARDENING HELP SEQUESTER CARBON?

- +perennial crops
- +reduced or elimination of tillage, digging, mowing, fossil-fuelled equipment used
- +increasing soil carbon sequestration
- +reduced lawn area



Image: Community Food Forest, Bloomington Indiana.  
[www.sustainableameric.org](http://www.sustainableameric.org)

IF YOU ARE GOING  
TO REPLACE/REMOVE  
SOME LAWN, KEEP  
CARBON FARMING  
GOALS IN MIND!

**What is  
happening  
here? →**



# CHALLENGES, CONSIDERATIONS

+privilege

+climate change itself -- changing regional climates, migrating species,

QUESTIONS?

*THANK YOU!*